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ENVIRONMENTAL POLLUTION AND HEALTH **HAZARDS CREATED BY EXPOSURE OF** **ELECTROMAGNETIC WAVES INCLUDING** **MOBILE PHONE WITH LEGAL GUIDELINES**

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Abstract:

Electromagnetic waves pass through any type of mediums like solid, liquid, gaseous materials, air and space. Electromagnetic waves are manufactured from the beam of electrons passing through electric and magnetic fields acting perpendicular to each other. It moves in the air with the speed of light and having frequency very low range (3 Hz) to very high range (10^{24} Hz). It comprises with electromagnetic spectrum under different frequencies arranging in increasing range such as radio waves, microwaves, infrared radiation, visible light waves, ultraviolet radiation, X-rays, gamma rays etc. Maxwell invented mathematical formulas regarding electric and magnetic field for the propagation of electromagnetic waves. Conception of electromagnetic waves is proposed that they consist of photons which are massless and chargeless particle. In this paper, it is discussed that electromagnetic waves are bunch of free electrons moving with the velocity of light having very huge (infinity) mass penetrating all type of materials, air and space. Exposure of electromagnetic waves from different sources like mobile phone, electronics equipment, satellite and radar system etc. is causing environmental pollution and health hazards to living creatures including human one with slow killing ability. It is urgently necessary to frame guidelines and rules for saving nature and its inhabitants from high frequency electromagnetic waves.

Index Terms: Electromagnetic waves, Electron's mass moving at the speed of light, Electron's rest mass, Environmental pollution, Free electrons, Frequency spectrum, Health hazards, Mobile phones, Photons.

I. Introduction

There is no sound in space, because there are no molecules in space to transmit (carry) the sound waves. Electromagnetic waves are not like sound waves, since they do not need molecules to travel. It is observed that electromagnetic waves can travel through air, solid objects and space. Astronauts on space-walks (vehicle) use radio waves to communicate. Radio waves are a type of electromagnetic waves.

Electromagnetic waves are framed when an electric field couples with a magnetic field. Magnetic and electric fields of an electromagnetic wave are perpendicular to each other and to the direction of the electromagnetic wave. Radio waves, television waves, microwaves, X-Rays, visible light waves are all examples of electromagnetic waves [1]-[6]. They only differ from each other in wavelength or frequency. Wavelength is the distance between one wave crest to the next and the frequency is the number of wavelengths repeated in a second.

The smaller the wavelength (higher the frequency), the higher the energy, e.g., a brick wall blocks visible light wavelengths, but more energetic X-rays (having higher frequency and smaller wavelength) can pass through the brick walls. It is proved that electromagnetic waves are “blocked” by certain materials like water, buildings, lead etc., i.e., the wavelengths of energy are “absorbed” by objects. The atmosphere also absorbs some wavelengths of electromagnetic waves while to pass through. Production of electromagnetic waves by the electric and the magnetic fields are shown in Fig. 1.

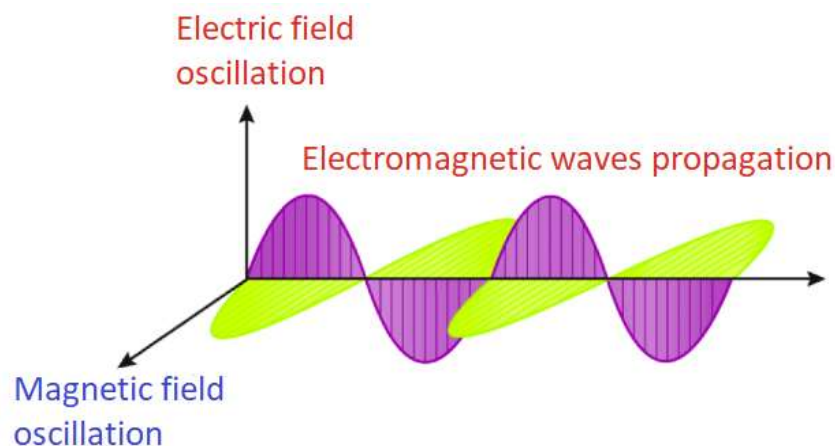


Fig. 1. Production of Electromagnetic Waves by the Electric and the Magnetic field oscillations.

All the electromagnetic waves travel at a speed of 3×10^8 meters/second which is the speed of light. All the electromagnetic waves travel with the speed of light in medium or free space, they don't need

any material medium to travel as required by other mechanical waves like sound wave, water wave and electrical wave.

When electromagnetic waves travel through space, it does not lose energy to a medium. When they strike matter, they lose energy, they may be reflected or refracted or diffracted or absorbed by the matter and converted to other forms of energy like heat, electricity etc.

II. Electromagnetic Waves Characteristics

An electromagnetic wave is produced when an electrically charged particle vibrates. A vibrating charged particle causes the electric field surrounding it to vibrate as well. A vibrating electric field, in turn, creates perpendicularly a vibrating magnetic field. Again a vibrating magnetic field is applied on the charged particle which also creates perpendicularly a vibrating electric field. These two types of vibrating fields (electric and magnetic fields) acting perpendicularly (at right angles) combine to create an electromagnetic wave which travels perpendicular to the both fields. Therefore, an electromagnetic wave is a transverse wave. They are deflected neither by the electric field nor by the magnetic field. However, they are capable of showing interference or diffraction [1]-[6].

Electromagnetic waves are split into a range of frequencies (wavelengths), this is known as the electromagnetic spectrum in increasing frequency like radio waves, microwaves, infrared radiation, visible light waves, ultraviolet radiation, X-rays, gamma rays, shown in Table 1.

Table 1 Electromagnetic Spectrum

Name of the Spectrum	Wavelength	Frequency
Radio waves	100 Mm – 1 m	3 Hz – 300 MHz
Microwaves	1 m – 1 mm	300 MHz – 300 GHz
Infrared Radiation	1 mm – 750 nm	300 GHz – 400 THz
Visible Light	750 nm – 400 nm	400 THz – 800 THz
Ultraviolet Radiation	400 nm – 1 nm	10^{15} Hz – 10^{17} Hz
X-Rays	1 nm – 1 pm	10^{17} Hz – 10^{20} Hz
Gamma Rays	1 pm – 0.0001 pm	10^{20} Hz – 10^{24} Hz

This is clearly explained by Max Planck and Albert Einstein's Modern Quantum Theory such as electromagnetic waves consist of photon particles (as they assumed) and the energy (E) possessed by

the waves or photon particles are calculated [1]-[3]. Photon is a massless and chargeless elementary particle having particle and wave properties both as per their assumptions. If the energy of each photon is E ;

Then, $E = hf$ (1)

where h is called Planck's Constant, $h = 6.626 \times 10^{-34}$ joule-second; f or ν is the linear frequency of the electromagnetic waves. If velocity of electromagnetic waves is c and λ be the wavelength, we know, $f\lambda = c$, then $f = c/\lambda$,

Therefore, $E = hf = hc/\lambda$ (2)

Velocity of electromagnetic waves, c is equal to the velocity of light,

Hence, $c = 2.9979 \times 10^8$ meters/second or 1,86,000 miles/second.

Therefore, it is seen that if frequency of the electromagnetic waves is high, it will possess more energy, and thus it will penetrate the atoms, i.e., living and non-living body with more energy or power. It is already proved by Albert Einstein in Photoelectric Effect (earned Nobel Prize in 1921 for this) that when high frequency electromagnetic waves consisting of photon particles fall any atoms (metallic or non-metallic), the photons will release electrons from the atoms, called photoelectrons, cause current generation or current flow through the circuit.

Actually, the assumption of electromagnetic waves as photons like massless and chargeless particle is not correct; if a photon is massless, then its energy (potential and kinetic both) becomes zero, i.e., the photon cannot strike with certain energy. Therefore, the photons are nothing except free electrons which have very less mass in rest (stationary) condition, i.e., 9×10^{-31} kg; and infinity or huge mass in free stage when moving with the speed of light. Hence, electromagnetic waves are free electrons having very huge (infinity) mass comparing to its volume (radius of an electron, $r = 2.82 \times 10^{-15}$ m), and negative charge moving with the speed of light [7].

Whenever electromagnetic waves exist in a medium with matter, their wavelength is decreased. Wavelengths of electromagnetic radiation, whatever medium they are traveling through, are usually quoted in terms of the vacuum wavelength, although this is not always explicitly stated.

III. Electromagnetic Waves Theory

With the publication of “A Dynamical theory of the Electromagnetic Field” in 1865, James Clerk Maxwell (Scotland, U.K.) demonstrated that electric and magnetic field travels through space as waves moving at the speed of light. Maxwell’s equations encompass the major laws of electricity and magnetism [1]-[7].

The four Maxwell equations are on electromagnetic theory corresponding that D is the electric flux density coulombs/sq. meter, ρ (rho) is the electric charge density coulombs/cubic meter, B is the magnetic flux density weber/sq. meter, E is the electric field intensity volt/meter, H is the magnetic field intensity amperes/meter, J is the electric current density ampere/sq. meter, and they are expressed below:

$$(i) \operatorname{div} D = \rho \quad (ii) \operatorname{div} B = 0 \quad (iii) \operatorname{curl} E = -\frac{\partial B}{\partial t} \quad (iv) \operatorname{curl} H = \frac{\partial D}{\partial t} + J$$

Constitutive relations are-

$$D = \epsilon E, B = \mu H, J = \sigma E.$$

Where ϵ is the permittivity of the material, μ is the permeability of the material and σ is the conductivity of the material. Vacuum behaves like a perfect linear “material” without additional polarization and magnetization.

The compact way of writing these equations in the meter-kilogram-second (mks) system is in terms of the vector analysis operators divergence (div) and curl, i.e., in partial differential equations form. The equations describe how the electric field can create a magnetic field and vice-versa. Here Maxwell established relations between the electric field intensity (E) and the magnetic flux density (B); the magnetic field intensity (H) and the electric flux density (D).

IV. Production of Electromagnetic Waves

Electromagnetic waves travel through empty space or through insulating materials, but they cannot travel through conducting materials, although they can travel along their surfaces. When alternating current flows through a wire (i.e., electric charges are accelerated), it produces lesser amount of electromagnetic waves. The frequency of the electromagnetic waves created by this way equals to the frequency of the alternating current.

The inverse effect also happens, if an electromagnetic wave strikes a wire (i.e., receiving antenna), it induces an alternating current of the same frequency in the wire. This is how the receiving antennas of a radio or television sets work [4]-[7]. Thus, an antenna is the most efficient when its length is of the order of the wavelength of the electromagnetic waves emitted or received. For TV transmission, electromagnetic waves having wavelengths of the order of one meter, which is also the size of a typical TV antenna. The size (radius) of the antenna will be decreased as the frequency of the electromagnetic waves increased.

Therefore, electromagnetic radiation is produced whenever a charged particle, such as an electron changes its velocity, i.e., whenever it is accelerated or retarded (decelerated).

The generation of electromagnetic radiation into two categories is below:

- (i) Systems or processes that produce radiation covering a broad continuous spectrum of frequencies, e.g., the Sun with its continuous spectrum.
- (ii) Those that emit (and absorb) radiation of discrete frequencies that are characteristics of particular systems, e.g., a radio transmitter or receiver tuned to one frequency.

Because any change in motion is an acceleration or deceleration (retardation), circulating currents of electrons produce electromagnetic radiation. When these circulating electrons move at relativistic speeds (i.e., approaching the speed of light), then the brightness of the radiation increases enormously. This radiation was first observed at the General Electric Company in 1947 in an electron synchrotron which is a type of particle accelerator that forces relativistic electrons into circular orbits by using powerful magnetic fields.

Electromagnetic waves consist of wavelengths range from 10^{-16} m to 100 Mm which corresponds to frequencies from 3×10^{24} Hz to 3 Hz. All the energy from the Sun that reaches the earth arrives as solar radiation, part of a large collection of energy called the electromagnetic radiation spectrum. Solar radiations are composed with electromagnetic radiation like visible light, ultraviolet light, infrared radiation, radio waves, X-rays and gamma rays. Radiation is one way to transfer heat energy. Every object or matter is continually radiating electromagnetic waves unless its temperature is at absolute zero, i.e., -273° C.

Molecules or atoms emit radiation when high energy electrons in a high atomic level (higher shell or orbit) fall down to lower energy levels (lower orbit). The energy lost is emitted as electromagnetic waves radiation, e.g., light, infrared, radio waves etc. When energy is absorbed by an atom, it causes the electrons to “jump” up to higher energy levels (higher orbit or shell). Therefore, all atoms (objects) absorb and emit radiation, i.e., electromagnetic waves. When the absorption of energy balances the emission of energy, the temperature of the atoms stays constant. If the absorption of energy is greater than the emission of energy, the temperature of an object rises. If the absorption of energy is less than the emission of energy, the temperature of an object falls.

Electromagnetic radiation is made when an atom absorbs energy. The absorbed energy causes one or more electrons to change their locale within the atom.

When the electron returns to its original position, an electromagnetic wave is produced. Depending on the kind of atom and the amount of energy, this electromagnetic radiation can take the form of heat, light, ultraviolet, or other electromagnetic waves.

There are several ways of causing atoms to absorb energy. One way is to excite the atoms with electrical energy. We do this in neon signs (tubes). The electricity we put through the neon tubes will excite or add energy to the neon atoms. These electrons in these atoms are then in a high energy state. The electrons don't like to be in the high energy state and will fall back down into the low energy state giving off radiation which we see as light.

In electromagnetic waves, energy is transferred through vibrations of electric and magnetic fields. Quantum physics explains that electrons kick up virtual photons (i.e., free electrons), which travel at the speed of light and hit other particles, exchanging energy and momentum. Here virtual photons are free electrons only.

The German physicist Heinrich Hertz was the first to generate and detect certain types of electromagnetic waves in the laboratory in 1887.

It is observed that when an electric field is applied, a magnetic field will be automatically exist or evolve which is perpendicular to the electric field, and vice-versa. Therefore, when both the electric

field and the magnetic field are acting simultaneously at right angles (perpendicular) to each other, the strengths of the both fields are high enough to oscillate (skip out) electrons releasing from the atoms forming electron beam as electromagnetic waves perpendicularly to the both fields.

If an electron moves with a velocity v , its mass $m_1 = m_0 / \sqrt{1 - \left(\frac{v^2}{c^2}\right)}$,

where c = velocity of light, m_0 = electron's rest mass; this equation indicates the mass will increase with the increase of its velocity, in this equation the electron's mass increases 1% when velocity increases 15% of velocity of light, if $v = c$, m_1 becomes infinity [2]-[9]. Since electromagnetic waves travel with the speed of light and it consists of free electrons only which have very huge (infinity) mass, therefore these tiny electrons having radius, i.e., $r = 2.82 \times 10^{-15}$ m can penetrate any material. Thus when electromagnetic waves consisting of free electrons are moving inside any material, air and space, its mass is infinity, i.e., huge mass. Due to this characteristic, electromagnetic waves or free electrons can penetrate any type of materials.

V. Environmental Pollution with Global Warming Controlled by National and International Rules

In India, National Committee on Environment Planning and Co-ordination (NCEPC) established 1972. It is apex advisory body in India in all matters relating to environmental protection and improvement. Supreme Court of India (SC) recognized the fundamental norms in the Constitution of India regarding environment protection [10]-[11] are mentioned below:

(i) Every person enjoys the right to a wholesome environment, which is a facet of the right to life guaranteed under Article 21 in the constitution of India [10].

(a) Subhash Kumar vs. State of Bihar, AIR 1991 SC 420;

(b) M. C. Mehta vs. Union of India, 1992 (3) SCC 256, 257;

(c) Virendra Gaur vs. State of Haryana, 1995 (2) SCC 577, 581;

(ii) Enforcement agencies are under an obligation to strictly enforce environmental laws.

(a) Indian Council for Enviro-Legal Action vs. Union of India, 1996 (5) SCC 281, 294, 301.

(iii) Government agencies may not plead non availability of funds, inadequacy of staff or other insufficiencies to justify the non performance of their obligations under environmental laws.

(a) Dr. B. L. Wadehra vs. Union of India, AIR 1996 SC 2969, 2976;

Environmental protection and improvement were explicitly incorporated into the constitution of

India by Forty-Second (42nd) amendment of 1976 and Article 48A was added to the directive principles of state policy. It declares that “The state shall endeavour to protect and improve the environment and to safe guard the forests and wild life of the country.” Article 51A(g) in a new Chapter entitled ‘Fundamental Duties’, impose a similar responsibility on every citizen [10]–[11] ‘to protect and improve the natural environment including forests, lakes, rivers, and wild life, to have compassion for living creatures.’ Apart from Article 21 of the Constitution, the right to equality guaranteed in Article 14 may also be infringed by government decision that have an impact on the environment.

(a) *Ajay Hasia vs. Khalid M. Shervardi*, AIR 1981 SC 487, 499.

For freedom to Trade vis-à-vis Environmental Protection: As environmental regulation grows more stringent and its enforcement becomes more vigorous, industrial challenge to agency action is likely to increase. Courts will then need to balance environmental interests with the fundamental right to carry on any occupation, trade or business in Article 19(1)(g).

A great American Judge emphasizing the imperative issue of environment said that he placed Government above big business, individual liberty above Government and Environment above all. Therefore, the issues of environment must and shall receive the highest attention from the Court.

There are framed so many legislation in India regarding environment protection, such as, The Indian Forest Act, 1927; The Factories Act, 1948; The Mines and Minerals (Regulation and Development) Act, 1957; The Atomic Energy Act, 1962; The Insecticides Act, 1968; The Radiation Protection Rules, 1971; The Wild Life (Protection) Act, 1972; The Water (Prevention and Control of Pollution) Act, 1974, The Water (Prevention and Control of Pollution) Cess Act, 1977; The Forest (Conservation) Act, 1980; The Air (Prevention and Control of Pollution) Act, 1981; The Environment (Protection) Act, 1986; The Hazardous Wastes (Management and Handling) Rules, 1989, The Public Liability Insurance Act, 1991; The National Environment Tribunal Act, 1995; The National Environment Appellate Authority Act, 1997; Noise Pollution (Regulation & Control) Rules, 2000; National Green Tribunal Act, 2010; The E(Electronic)-Waste (Management and Handling) Rules, 2011.

To implement the decisions taken at the United Nations Conference on the Human Environment held at Stockholm in June, 1972, Parliament of India enacted the nationwide Air Act under Article 253 of the Constitution. The scope of this law and its concern is for the detrimental effect of air pollution on

the health of the people as also on animal life, vegetation and property. Air Act is amended in 1987 which strengthened the enforcement machinery and introduce stiffer penalties. Under the Atomic Energy Act, 1962 and The Radiation Protection Rules, 1971; the Central Government is required to prevent radiation hazards, guarantee public safety and the safety of workers handling radioactive substances, and ensure the disposals of radioactive wastes.

Government of India enacted the Environment (Protection) Act, 1986 [EPA] under Article 253 of the Constitution. This Act is to implement the decisions of the United Nations Conference on the Human Environment, 1972 to the protection and improvement of the human environment, prevention of hazards to human beings, living creatures, plants and property.

Section 7 of the EPA prohibits the discharge or emission of environmental pollutants in excess of the prescribed standards [10]-[11]. To implement this mandate, the government has framed the Environment (Protection) Rules, 1986 [EPR]. The Hazardous Wastes (Management and Handling) Rules was issued under the Act in July, 1989 which have introduced a permit system to regulate the handling and disposal of hazardous dangerous wastes.

EPA recognized vehicular pollution, noise pollution etc. India has obligation under numerous international treaties and agreements that relate to environmental issues. Although environmental protection and human rights are often treated as separate legal topics, there are many situations where the two fields overlap. First, many governments and international bodies have recognized the right of citizens to live in a clean and healthful environment. Second, environmental and natural resource policies may disproportionately affect poor and minority communities. With respect to the protection of indigenous people as a means to conserve biodiversity, international environmental law can play an important role.

After two decades from the United Nations Conference on Environment at Stockholm in 1972; United Nations Conference on Environment and Development was held at Rio de Janeiro, Brazil in 1992. In this conference, the world community wanted to balance between environment and development, and accordingly the 27 principles adopted in the conference to guide the behavior of the nations towards more environmentally sustainable pattern of development; it adopted as 'Agenda-21' for action into the twenty first century. National Green Tribunal Act, 2010 will fulfill the aspirations to have special environment court to deal the environmental matters only.

National Academy of Sciences of the United States in a recent report has also confirmed that the world temperature is rising and it is expected that the trend will continue. The earth surface temperature will rise between 2.5 and 10 degrees celsius in the next hundred years due to greenhouse effect [12].

This greenhouse effect refers to the gradual or global warming of the earth's atmosphere. This global warming is created by industries, oil and chemical refineries, transport vehicles by oil fuel in road and airways, wood or tree products burning, mining, rapid growth of entertainment equipment like air conditioned (AC) machine, refrigerator etc., excessive electromagnetic waves propagation through air like mobile phone, radio and television, satellite and computer network, MP3, CD, DVD player, microwave oven, electronic instrument, sensor and remote control etc. The presence of molecules for greenhouse gases like carbon di-oxide, carbon mono-oxide, methane and other hydrocarbons, nitrous oxide, chlorofluoro carbons (CFCs), water vapour and electromagnetic waves, all of which have the capacity to warm and have an effect on the climate for attributing to the greenhouse effect [13].

The ozone layer acts as our planet's sunscreen providing an invisible filter which protects all kinds of life on the earth from the damaging ultraviolet rays or electromagnetic spectrum of the sun. It also protects the earth's magnetic field. This ozone layer is destructed by the greenhouse gases specially CFCs. Thus the greenhouse effect plays a crucial role in maintaining a life sustaining environment on the earth. The greenhouse gases, thereby, changing the natural environment and increases the earth's temperature causing global warming which is a threat to the humanity.

The Intergovernmental Panel on Climate Change (IPCC) was established in 1988 by the World Meteorological Organisation (WMO) and the United Nations Environment Programme (UNEP) to investigate the environment problem that is threatening the world. IPCC gives four assessment reports in 1990, 1995, 2001, 2007 and special report in 2018.

United Nations Convention on Climate Change was held in Kyoto, Japan in December 1997 to assess the progress during last five years and make future plans by fixing strategies and objectives for future. United Nations Convention on Climate Change 8th meeting held at New Delhi, India in 2002; 13th meeting at Bali, Indonesia in 2007; 15th meeting at Copenhagen, Denmark in 2009; and 21st meeting at Paris, France in 2015 (30th Nov – 12th Dec) called COP 21. Negotiations during this COP 21

conference ended with the adoption of the Paris Agreement, governing climate change reduction measures from 2020. The goal of this agreement is to keep the increase in global average temperature to well below 2°C above pre-industrial levels and to limit the increase to 1.5°C , since this would substantially reduce the rises and effects of climate change. Again there is no worldwide conference or convention held to measure the effect on the exposure of electromagnetic waves and its health concern [10]-[13].

VI. ENVIRONMENTAL POLLUTION CREATED BY ELECTROMAGNETIC WAVES

This super high frequency electromagnetic waves transmitted by electronics equipment like microwave oven, satellite system and antenna, 4G, 5G and higher generation mobile communications system (Mobile Exchange like BTS, BSC, MSC etc., Mobile Instrument or Phone) in MHz to GHz range radiating in different paths (multiple paths) by MIMO (Multiple-Input-Multiple-Output) antennas have ailing (sick) effect on animals, birds, human health including trees [7]-[9]. This high frequency electromagnetic (EM) waves gradually decrease human, animal's and tree's body immunity (resistance) and causes severe illness, even death. It is observed that the most of the small birds and insects pass away from the nature due to the high frequency intensified electromagnetic waves. Trees are not able to produce fruits as per standard, e.g., coconut tree, orange tree, wheat tree etc. If human body immunity and lungs activity are checked especially in city and suburban area people, then it will be clearer about the effect of high frequency electromagnetic wave signals from different sources. Therefore, it is seen that if frequency of the electromagnetic waves is high, it will possess more energy, and thus it will penetrate the atoms, i.e., living body with more energy or power. The electromagnetic interference (EMI) or pollution from electronic devices causes malfunctioning of neighboring sensitive devices and negative impact (harmful effects) on animal life and environment. Therefore, the exposure of electromagnetic waves are minimized by shielding of electromagnetic waves (radio frequency) by different shielding materials like carbon materials and their composites, lead, water etc. Low level exposures of electromagnetic waves cause headaches, anxiety, depression, nausea, fatigue, electromagnetic hypersensitivity, skin symptoms, nerve disorder, loss of libido (sexual desire) and suicide; while higher level exposure of electromagnetic waves cause damage to the DNA inside a living cell, i.e., cancer [7]-[13].

The World Health Organization (WHO) began a research effort in 1996 to study the health effects from the ever-increasing exposure of electromagnetic waves (EMI) to the people from diverse range of electromagnetic waves transmission sources [10]. In 2011, the WHO and International Agency for Research on Cancer (IARC) has classified electromagnetic fields as possibly carcinogenic to humans, based on an increased risk for glioma, a malignant type of brain cancer, associated with mobile phone use. In the United States, non-ionizing radiation (below ultra-violet level) is regulated in the Radiation Control for Health and Safety Act of 1968 and the Occupational Safety and Health Act of 1970. International Commission on Non Ionizing Radiation Protection (ICNIRP) with WHO declared in 1998 that electromagnetic waves in non-ionizing state (0-300 GHz) do not produce any known adverse health effect, although huge number of research papers (more than 5000) focus different health problems and environment pollution created by electromagnetic waves exposure in air.

Specific Absorption Rate (SAR) in respect of mobile handsets is prescribed by ICNIRP maximum limit as 2 watt/kg averaged over 10 gm human tissue in 2008, in the frequency range of 10 MHz to 10 GHz. It is revised as 1.6 watt/kg averaged over a mass of 1 gram human tissue in 2013 (also applicable in India) [13]. There are so many organizations worldwide to look after and control the electromagnetic waves causing pollution, such as, International Commission on Non Ionizing Radiation Protection (ICNIRP), International Agency for Research on Cancer (IARC), United Nations Environment Programme (UNEP), International Labour Organization (ILO), International Telecommunications Union (ITU), European Commission (EC), International Electrotechnical Commission (IEC) and North Atlantic Treaty Organization (NATO) etc., but no strict guidelines and rules for minimizing the exposure of electromagnetic waves are framed so far [10]-[13].

United Nations Conventions on Climate Change 21st meeting at Paris (COP 21) led to a new international climate agreement in 2015, applicable to all countries, aiming to keep global warming at 1.5° C - 2° C, in accordance with the recommendations of the Intergovernmental Panel on Climate Change (IPCC). It was adopted by 196 Parties (Countries and Organisations) at COP 21 in Paris and force on November 2016. To achieve this, the Paris Agreement stipulates that all countries shall review their contributions to reducing greenhouse gas emissions every five years. The emission or exposure of electromagnetic waves also cause the rise of environment temperature and pollution, but minimization of the exposure of electromagnetic waves are not yet focussed or implemented in the world [10]-[13].

It is already proved by Albert Einstein in Photoelectric Effect that when high frequency electromagnetic waves consisting of photon particles fall any atoms (metallic or non-metallic), the photons will release electrons from the atoms, called photoelectrons, cause current generation or current flow through the circuit [7]-[9]. Therefore, the continuous exposure of high frequency electromagnetic waves to human, animal and trees body by electromagnetic wave signals generate photoelectrons in the atoms or molecules of human, animal and trees body causing current flow which effectively diminishes the body immunity, and hence several diseases will attack the body. This current is having very small value (few milliamperes), because matured human body has an internal resistance 500 ~ 700 ohms and dry skin resistance 1000 ~ 1,00,000 ohms. Generally the resistance of big size animal and tree body is having more than that of human one. Moreover, electromagnetic waves are absorbed by water particles. Human and animal adult bodies content about 60% water, some amount of electromagnetic waves are soaked up by the body's water particles, as a result the absorbed electromagnetic energy will increase the body temperature which evaporates the water particles at a faster rate; Hence water – electrolyte imbalance produces headache, fatigue and dehydration etc. Therefore, the continuous exposure in electromagnetic waves causes damage to heart, lungs, kidney, brain and all other organs of the human and animal body, turning to less immunity as a whole. It is already observed that those persons, working in high frequency electromagnetic waves zone like mobile exchange (MSC, BSC, BTS etc.), satellite earth station, radar system, manufacturing electronic equipment, remote control, sensor etc., are suffering from respiratory problems like bronchitis, asthma, pneumonia, tuberculosis etc. frequently, and they are prone to attack by the other severe diseases like diabetics, heart problem, blood pressure, kidney problem, cancer, Covid-19 and so on. This is happening because of the high frequency electromagnetic waves diminishing their immunity power completely.

Therefore, a trade off must be maintained for use of the range of frequency (electromagnetic spectrum) in GHz, the number of antennas in MIMO system, the number of trans-receivers (BTSs) in a locality and the data speed and use of electromagnetic waves as minimum as possible. Therefore, our precaution from the diseases and to maintain a stable human health system is to minimize the exposure of electromagnetic waves.

This can be done by restricting the number of electronic equipment transmitting electromagnetic waves in air, mobile exchange systems (hence mobile SIMs); and the use of mobile phones by keeping

switch off condition maximum time in a day and switch on condition call or message duration time only (communications have to be made by the help of email, sms, whatsapp, missed call etc.), so that human and animal body's and tree's immunity boost up and safe guard from all diseases.

VII. CONCLUSION

The exposure of Electromagnetic waves are increasing by leaps and bounds in our daily life from communications to medical, food cooking to entertainment and so on. At the same time it causes environmental pollution and health problems to living creatures with slow killing ability. By the confirmatory experiment, it is proved that electromagnetic waves are high speed (with the velocity of light) free electrons only, which are randomly moving in materials, air and space. Again electromagnetic waves are gradually decreasing its power by propagating distance through materials and air, because free electrons are absorbed by the materials and water. The exposure of electromagnetic waves have extreme health effect on living creatures including human one and create environmental pollution with global warming to the world and space. Therefore, suitable measure has to be taken to minimise the exposure of electromagnetic waves from various sources like mobile phone, electronic instrument, satellite system, radar system, remote control, sensor etc. throughout the world.

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