

## 5G radiation and potential risks to the environment and human health

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### Abstract :-

The rapid development in wireless communication technology and the urgent need to develop it has led to an increase in the public exposure to more radio spectrum frequencies. The mountain increases in terms of the damage caused by these wireless technologies for the 2G, 3G and 4G generations ending with the new technique, which is 5G. As a result of the urgent need for fast communications and wide packages of data, only a new generation of communications has emerged, which is 5G, which enjoys high speed and broadcasts in short waves and high frequency. There is great concern about the impact of these technologies on human health and safety. This technique works at relatively higher frequencies than the previously used technologies. This research sheds light on some of the expected harms of these technologies and the result of using these techniques, where the damages on the human body in general, and on the skin and the human eye in particular, are addressed, as well as their impact on the environment and plants in general.

**Keywords** - Public Health Issues; Environmental Issue; 5G communication, Wireless communication

### 1. Introduction: -

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The use of cellular mobile technology continues Worldwide Rise. A new 5th generation, faster (5G) Recently, the telecommunications infrastructure has been Endorsed by Government Communications, Commission(FCC) with initial antennas Installation and testing are now under way. Although it may offer Uber automation and "immersive" instantaneous" us" There are a lot of concerns about entertainment with respect to Public health and wireless system protection[1]. 5G The higher millimeter wave frequencies would include the For internet and communications, never before used In technology[1]. The 5G rollout recommends the addition of Microwave spectrum frequencies in the medium-Mid- (3.7GHz-24 GHz), mid- (0.6 GHz-3.7 GHz), and High-band frequencies (24 GHz and above for higher speeds Telecommunications. Since these higher frequencies do not move far[1].

This scheme, blocked by walls, would have to use A dense network of outdoor fixed antenna every 300 m as well as indoor devices[2]. This radiation, like that radiation 2G, 3G and 4G telecommunications networks do not have long-term health consequences have been pre-market checked for despite the fact that it would reveal people.Fig 1. Displays the MMW cell with a low-frequency cell Wireless communication frequency spectrum[3].

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Fig. 1. Wireless communication in life

## 2. Problem on Public Health

The primary absorption of millimetre waves (MMWs) is within 1 to 2 millimetres of human skin and within 1 to 2 millimetres of human skin Corneal surface layers. Therefore, the skin or the near surface The main goals of the tissue zones are the with radiation. Since the skin comprises capillaries and nerves, MMW bio-effects can be transmitted by endings, Via the skin's molecular pathways or through Via the nervous system.[4].

5G high spectrum range can lead to cell mutations It causes tumours that may become cancer later.5G radiation exposure increases the output of from ROS. Standard of Reactive Oxygen Species (ROS) are A portion of cellular processes and signalling for cells. The overproduction of non-balanced ROS With Superoxide dismutase (both endogenous antioxidants) (SOD), catalase (CAT), glutathione peroxidase (GPx), melatonin, glutathione (GSH), or exogenous Antioxidants (Vitamin C, Carotenoids, Vitamin E, Polyphenols) allow free radicals to form Oxidizing and destroying



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DNA, proteins and membranes Mitochondria and lipids. There are no mitochondrial histones as a consequence of that it does not restore damage to DNA and is not protected from reactive oxygen species in mitochondria.

## 2.1 Skin Effects

A variety of studies have shown the surface Low-intensity MMW effects can be very important.

Substantial, triggering a variety of biological modifications, And at non-thermal, like cell membrane, levels Repercussions[5]. Application of those frequencies in the short term Stimulates the release in the area of endogenous opioids About skin. It appears that the MMW range of 95 GHz affects The cutaneous nociceptors and act as a dangerous material Stimulus without thermal disruption or heating. The sweat glands were suggested by researchers as a Objective. Application of certain frequencies in the short term Triggers the release in the region of endogenous opioids About skin. It appears that the MMW range of 95 GHz affects The cutaneous nociceptors which serve as a hazardous material Stimulation without thermal disturbance or heating. The sweat glands were proposed as a target by researchers. Feldman et al (2008;2009) found that helically shaped sweat ducts are tubes in human skin filled with an aqueous conductive solution[6].

## 2.2 Effects on The eyes



The leading cause of blindness has been cataracts. As a 5G device, there is a clear concern for 5G applications. The eyes would also receive substantial radiation, Especially for near field exposure. Well-established risk factors in cataract formation are age, exposure to smoking, diabetes, and UVB[7].

### 2.3 Effect of Neurology

When disturbed by the nervous system or the brain, EMR, Electrophysiological, Morphological, and There may be chemical shifts. A significant alteration in these positions would eventually lead to a shift in conduct. The physiological effects of EMR, yes, blood brain changes documented in the literature include barrier, electrophysiology, Anatomy, Cellular metabolism, neurotransmitter activities, Calcium efflux, drug reactions that affect the Nervous System[8]

### 2.4 ISSUES OF THE ENVIRONMENTAL

In places, birds and other wildlife are disappearing Which are saturated with "non-ionizing" radiation 4G. The dreadful manmade frequencies that emanate from Our machines destroy innocent lives, literally, beings or allowing them to escape en masse[9]. Humanity Next is it. There will be no life form that can withstand 5G for Any length of time. Its presence in our planet is a presence of Murderous, genocidal assault on Life

### 3.1 Effect on vegetation

A research on aspen seedlings in 2010 determined Radio frequency sensitivity has caused leaves to exhibit symptoms of necrosis, though trials focused on Armenian Low intensity millimetre waves have been shown to evoke isoenzyme peroxidase (a stress protein in plants) Changing the spectrum of wheat shoots. In the present tense, Job, the effect of EMI EHF on total peroxidase Spectrum of activity and isoenzyme in wheat seedlings Cells have been observed[10].

### 3.2 Wildlife Consequences

With the arrival of 3G technology, there has been Increased accounts of the abandonment of their nests by birds as

As well as health concerns including the loss of plumage, Problems with locomotion, diminished survivorship[11], and death," says Alfonso Balmori, a researcher. Species of Birds Non-ionizing, which is impaired by these low levels, radiation from the MM Wave is House Sparrows, Rock Doves, Storks of Ivory, Collared Doves, and Magpies,

Among others, But it's not the birds alone. The decreasing population of bees is also said to be connected to

Radiation from this non-ionizing EMF. This decreases the egg laying process. The queen's talents have contributed to a fall in Power of the colony. In the Netherlands, an incident occurred because of In November, the 5G experiment killed 287 birds. In 2018[12].

#### **4. THERMAL EFFECTS Overall**

1- When receiving EM radiation, it is transformed to Into the sun. A process readily comprehensible Tissue heating is the effect of radiation. (effect of thermal). Altering their biological processes Functions as a consequence of a temperature change. When nuclear radiation takes place[13], this causes the charged particles to cause the matter to Oscillate and obtain strength. The true destiny of This energy is dependent on the scenario. It should have been It is re-radiated instantly and appears dispersed, Radiation reflected, or distributed. Also, it can get Dissipated into other inside microscopic movements Coming to thermal equilibrium, and the matter as thermal energy expresses itself in the Substance.

2- Intense radio waves can burn living conditions thermally.

Tissues and food can be fried. Besides infrared, Visible lasers, sufficiently powerful and ultraviolet Lasers can set paper afire quickly, too. Ionization High-speed electromagnetic radiation can create But several times, after these electrons collide with Eventually, much of the energy is downgraded to thermal energy by other atoms in the material[14]. This whole process occurs in a tiny fraction of the a second, in a substance, electrons and break chemical bonds.

#### **3. The phase of inverse or time-reversed**

Thermal radiation is responsible for absorption. The radiation that results can subsequently be Another piece of matter consumed,

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with The energy deposited heats the material[15]. Radiation of a significant mechanism for the transfer of heat

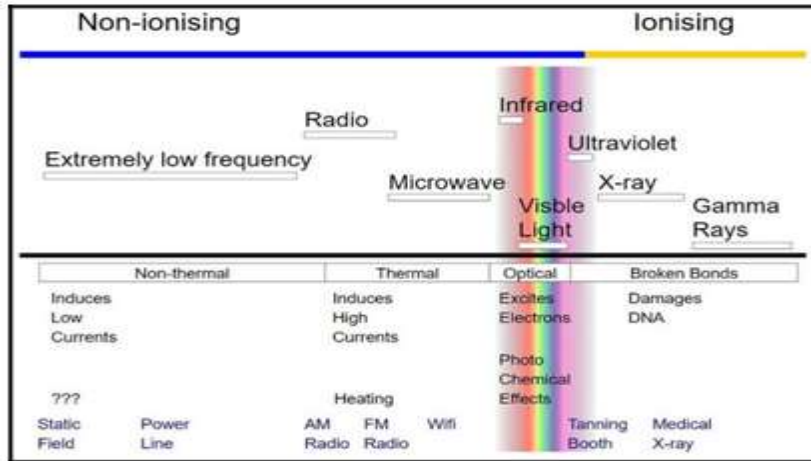


Fig 4.1 Ionising and Non-ionising Spectrum

### 5.1 Specific ABSORPTION Rate (SAR)

The pace at which humans consume radiation specific absorption rate (SAR), measured by the body, Measured in watts per kg (W/kg) of tissue in units[16]. If The created heat is tiny, the body's Without a thermoregulatory system, it can dissipate Causing detrimental results. If it reaches the temperature This skill, approximately 1 to 2 degrees Celsius. Tissue there may be damage. Every mobile phone is shipped with A SAR ranking (although some producers are attempting to its hide). Regulatory agencies have set their maximum standard. Depending on its nature, radiation, Antenna, how to keep it and how to use it. Institute of the Engineers of Electrical and Electronics (IEEE)[17]. Guy and Radiation





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Committee, both national and national, Security has been developed by international organizations Guidelines for RF Energy Exposure.

## 5.2 FCC Limits of 5G MMWave exposure

For mobile phones, laptops, and others, SAR levels are used to assess regulatory enforcement, handheld wireless devices Observance. For applications with millimeter wavelengths and Power density for utilities above 6 GHz (FCC) and There is a need to test above 10 GHz (ICNIRP) with Density of power (FCC, 1997; Wu et al., 2015a)[5] . The higher energy absorption in a shallow region is due to That causes more rapid heating, resulting in a lot of higher levels of SAR. Maximum Allowable Exposure (MPE) of the FCC in Power Density Conditions for frequencies between 1.5 And 100 GHz over a duration of 30 minutes is 10 mW/cm<sup>2</sup> (FCC, 1997; 2014: Romanenko et al.). Generated Heat in handheld devices for 5G, it is a problem but still is considered the only true damage measure, no It takes into account biological cellular alterations (Wu et et The. al., 2015a).

## CONCLUSION

In this age of emerging technologies of communication, it is There are more drawbacks than the incentives, and it

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Life-threatening as well has been. 5G in MM Wave software offers high data rates and Make all related to the IOT, which can be Considered an optimistic but dangerous point Impact on human health and ecosystems of 5G MM Wave If we try to minimize the results by attempting to reduce them, it is not zero. Given the importance of SAR, 5G software will It should be regarded as fruitful.

**REFERENCES: -**

- [1] G. A. Akpakwu, B. J. Silva, G. P. Hancke, and A. M. Abu-Mahfouz, "A survey on 5G networks for the Internet of Things: Communication technologies and challenges," *IEEE access*, vol. 6, pp. 3619-3647, 2017.
- [2] W. Manan, "Propagation channel models for 5G mobile networks. Simulation and measurements of 5G propagation channel models for indoor and outdoor environments covering both LOS and NLOS Scenarios," University of Bradford, 2018.
- [3] B.-C. E. Ndinojuo, "5G, Religion, and Misconceptions in Communication during Covid-19 in Nigeria," *Jurnal The Messenger*, vol. 12, pp. 97-110, 2020.
- [4] J. Moskowitz, "5G wireless technology: millimeter wave health effects," *Electromagnetic Radiation Safety*, vol. 3, pp. 3-6, 2017.

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- [5] C. L. Russell, "5 G wireless telecommunications expansion: Public health and environmental implications," *Environmental research*, vol. 165, pp. 484-495, 2018.
- [6] Y. Feldman, A. Puzenko, P. B. Ishai, A. Caduff, I. Davidovich, F. Sakran, *et al.*, "The electromagnetic response of human skin in the millimetre and submillimetre wave range," *Physics in Medicine & Biology*, vol. 54, p. 3341, 2009.
- [7] M. F. McLaughlin, D. B. Donoviel, and J. A. Jones, "Novel indications for commonly used medications as radiation protectants in spaceflight," *Aerospace medicine and human performance*, vol. 88, pp. 665-676, 2017.
- [8] S. Goldberg, "Michigan House Energy Policy Committee 10/4/18 Testimony Key Points/References on 5G Associated Health Issues," *Bioelectromagnetics*, vol. 39, pp. 277-288, 2018.
- [9] O. Nizhelska, L. Marynchenko, and V. Piasetskyi, "Biological Risks of Using Non-Thermal Non-Ionizing Electromagnetic Fields," 2020.
- [10] K. Haggerty, "Adverse influence of radio frequency background on trembling aspen seedlings: Preliminary observations," *International Journal of Forestry Research*, vol. 2010, 2010.
- [11] S. Sivani and D. Sudarsanam, "Impacts of radio-frequency electromagnetic field (RF-EMF) from cell phone towers and wireless devices on biosystem and ecosystem-a review," *Biology and Medicine*, vol. ,4p. 202, 2012.

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- [12] A. E. Crawley, *Revival: Studies of Savages and Sex (1929)*: Routledge, 2018.
- [13] D. Kondepudi and I. Prigogine, *Modern thermodynamics: from heat engines to dissipative structures*: John Wiley & Sons, 2014.
- [14] B. A. Meyers, *Pemf-the Fifth Element of Health: Learn Why Pulsed Electromagnetic Field (Pemf) Therapy Supercharges Your Health Like Nothing Else!:* BalboaPress, 2013.
- [15] Y. V. Bykov, K. I. Rybakov, and V. Semenov, "High-temperature microwave processing of materials," *Journal of Physics D: Applied Physics*, vol. 34, p. R55, 2001.
- [16] S. ul Islam, G. Ahmed, M. Shahid, N. Hassan, M. Riaz, H. Jan, *et al.*, "Implanted Wireless Body Area Networks: Energy Management, Specific Absorption Rate and Safety Aspects," in *Ambient Assisted Living and Enhanced Living Environments*, ed: Elsevier, 2017, pp. 17-36.
- [17] K. Jomaa, "Electromagnetic Near-field Characterization & Occupational Exposure to RF Waves in Industrial Environment," 2018.