Letter To The FCC From Dr Yael Stein MD In Opposition To 5G Spectrum Frontiers

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Letter to the FCC from Dr. Yael Stein MD of the Hadassah Medical Center, Jerusalem, Israel in Opposition to 5G Spectrum Frontiers Millimeter Wave Technology

"Please protect Public Health and vote against exposure of the public to harmful G5 technology."

"Computer simulations have demonstrated that sweat glands concentrate sub-terahertz waves in human skin. Humans could sense these waves as heat. The use of sub-terahertz (Millimeter wave) communications technology (cellphones, Wi Fi, antennas) could cause humans to percept physical pain via nociceptors."

To:

FCC Commissioners
U.S. Senate Committee on Health, Education, Labor and Pensions
U.S. Senate Committee on Commerce, Science, and Transportation

July 9, 2016

Topic: G5 millimeter wave technology (Sub Terahertz frequencies/ Sub-THz)

A group of physicists from the Hebrew University in Jerusalem, together with several physicians, have researched "G5" millimeter wave technology (Sub Terahertz frequencies) and its interaction with the human body. I am a physician who participated in this research.

Human sweat glands as helical antennas:

The study of human sweat glands as helical antennas conducted by our group in Prof. Feldman's lab, began by looking at images of the skin created by optical coherence tomography (OCT), which revealed that the tips of the sweat ducts that expel the sweat from the gland to the pore at the surface of the skin have a helical structure (Knuttel et al, 2004; Lademann, Otberg et al. 2007; Tripathi et al, 2015). This, and the fact that the dielectric permittivity of the dermis is higher than that of the epidermis, leads one to assume that, as electromagnetic entities, the sweat ducts could be regarded as imperfect helical antennas (Feldman, et al. 2008, 2009; Kawase and Hayashi, 2011; Yang, Donnan et al. 2011; Hayut et al, 2013, 2014).

The prediction of this simulation was that there would be an influence of the sweat duct on reflected signal around 90 GHz and an even increased sensitivity in higher frequencies. Proton hopping was suggested as the phenomenon that causes the conductivity inside the sweat gland. Taking into consideration a drop in the electric potential caused by the difference in the pH values between the skin surface (pH=5.5) and the dermis (pH=6.9), one can posit the existence of an electromotive force that would provide the necessary additional charge flow in the duct.

Thus, the sweat ducts possess all the required features to reveal antenna-like behavior in the extremely high frequency band (EHF band or the millimeter/submillimeter band).

These assumptions were supported by a series of computer simulations which showed that the spectral response of the ducts indeed coincides with the prediction of the antenna theory.

Implications:

Computer simulations using the Finite Differences Time Domain (FDTD) method have clearly shown that sweat gland ducts are high absorption structures of mm-waves. SAR values

were about one order of magnitude higher with the sweat gland ducts and highly localized to within the sweat gland ducts (Shafirstein and Moros, 2011). Temperatures computed using a bio-heat equation demonstrated that the temperature maximum was moved toward the epidermis which is populated by pain nerve fibers and heat-sensitive keratinocytes. This situation is closer to direct contact with a hot surface, indicating that exposure to high power GHz irradiation should result in a sudden acute pain response even without direct heating of the stratum corneum.

This phenomenon may potentially affect all humans and especially susceptible members of the public using or being exposed to communications devices in the sub-terahertz waveband.

It is advisable that the as low as reasonably achievable (ALARA) principle be adopted for uses of this technology, while a major cross-disciplinary effort is generated to train researchers in bioelectromagnetics and provide monitoring of potential health impacts of RF-EMF.

Summary of conclusions:

(1) Public exposure to millimeter waves, in the sub-Terahertz frequency range, is currently less common. If these devices fill the public space they will affect everyone, including the more susceptible members of the public: babies, pregnant women, the elderly, the sick and electro hypersensitive individuals.

(2) Human sweat ducts transmit and perhaps also receive electromagnetic waves that reflect the person's emotional state, as an extension of the sympathetic nervous system that innervates sweat ducts

(3) These newly suggested physiologic and psychological functions of human sweat ducts have not yet been researched by neurophysiologists or by psychologists

(4) Computer simulations have demonstrated that sweat glands concentrate sub-terahertz waves in human skin. Humans could sense these waves as heat. The use of sub-terahertz (Millimeter wave) communications technology (cellphones, Wi Fi, antennas) could cause humans to percept physical pain via nociceptors.

(5) Potentially, if G5 WI FI is spread in the public domain we may expect more of the health effects currently seen with RF/ microwave frequencies including many more cases of hypersensitivity (EHS), as well as many new complaints of physical pain and a yet unknown variety of neurologic disturbances.

(6) It will be possible to show a causal relationship between G5 technology and these specific health effects. The affected individuals may be eligible for compensation.

Respected members of the FCC and U.S. Senate Committees,

Please protect Public Health and vote against exposure of the public to harmful G5 technology.

Respectfully,

Dr. Yael Stein MD
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Introduction:

Quickly changing technologies and intensive uses of radiofrequency electromagnetic field (RF-EMF)-emitting phones pose a challenge to public health. Mobile phone users and uses and exposures to other wireless transmitting devices (WTDs) have increased in the past few years. Between 2000 and 2014, the number of active cell phone subscriptions has increased from 700 million to nearly 7 billion, among a global population of 7.2 billion people.

Uses of the millimeter wave bands include point-to-point communications, inter satellite links, and point-to-multipoint communications. Future 5G mobile phones and Wi Fi routers using millimeter waves are already under development. Because of shorter wavelengths, the band permits the use of smaller antennas than would be required for similar circumstances in

the lower bands, to achieve the same high directivity and high gain. The net result is higher reuse of the spectrum, and higher density of users.

Health risks:

Besides higher risk of cancer, exposure to electromagnetic radiation in the radio/ microwave frequencies has been reported to affect: fertility in males and females, neurological effects on sleep quality, learning abilities and memory due to increased oxidative stress, to cause skin and gastrointestinal reactions, hypersensitivity phenomena (Electrohypersensitivity / EHS), and more.

Electrohypersensitivity / EHS is characterized by a variety of non-specific symptoms, which afflicted individuals attribute to exposure to electromagnetic fields.

The symptoms most commonly experienced include dermatological symptoms (redness, tingling, and burning sensations) as well as neurasthenic and vegetative symptoms (fatigue, tiredness, sleep disturbance, concentration difficulties, dizziness, nausea, heart palpitation, and digestive disturbances). The collection of symptoms is not part of any formally recognized medical syndrome, but it has been described in the medical literature as “a novel neurological syndrome.”

There is a very wide range of estimates of the prevalence of EHS in the general population. A survey of occupational medical centers estimated the prevalence of EHS to be a few individuals per million in the population. However, a survey of self-help groups yielded much higher estimates. Approximately 10% of reported cases of EHS were considered severe (WHO workshop on electromagnetic hypersensitivity, 2004).

Prevalence is rising following the ever-rising exposure of the general public to mobile and wireless technology. In Sweden, the prevalence of EHS was initially estimated at 1.5%, but a newer estimation indicates that 2.6–3.2% report EMF sensitivity (Hillert et al., 2002). In Austria, the prevalence was estimated at less than 2% in 1994, but in 2001 it had increased to 3.5% (Johansson, 2006). In Switzerland, 5% of the population has been estimated as EHS (Schröttner et al., 2008). In California, the prevalence of self-reported sensitivity to EMF was 3.2%, with 24.4% of those surveyed reporting sensitivity to chemicals (Kato and Johansson, 2012).

While the condition is still not formally recognized as a disease, in some countries (e.g. Sweden) it is formally acknowledged as a functional impairment, and people are eligible for compensation due to this condition.

Interactions of millimeter waves with living systems are believed to occur primarily on a subcellular or cellular level. Sub-THz and THz radiation may interact with cellular components at multiple levels, including chromosomes, DNA, genes and proteins. Older studies from the USSR and Eastern Europe as well as new studies have indicated that above 30 GHz there are frequency dependent biological effects.

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