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### Written evidence submitted by Professor Olle Johansson

1. Dear Honourable Members of the UK Parliament Inquiry Committee on Broadband and the road to 5G,
2. **Subject: The serious truth about wireless 3G, 4G, 5G needs to be urgently heeded - before the rollout of 5G results in an increase in the permitted levels of electromagnetic microwave radiation in the UK**
3. I am an associate professor, retired from the world-famous Karolinska Institute and the equally famous Royal Institute of Technology, Stockholm, Sweden, both with their close associations to the Nobel Prizes in Physiology or Medicine, Chemistry and Physics, and I am submitting testimony because I understand that you at present are concerned about the fast deployment of 5G wireless systems in your country, without adequate sharing of information with the public.
4. For many years I have been studying health effects of wireless gadgets, such as cell phones, WiFi, and similar. My research decades ago was instrumental to determine the old CRT computer monitors were biologically harmful and that's why we switched them out for the less impactful flat screen monitors. I also played a similar role for the protection of pregnant women in front of computers.
5. Wireless communication is now being implemented in our daily life in a very fast way. At the same time, it is becoming more and more obvious that the exposure to electromagnetic fields may result in highly unwanted health effects. This has been demonstrated in a very large number of studies and includes cellular DNA-damage (which may lead to an initiation of cancer as well as mutations that carry down generations), disruptions and alterations of cellular functions like increases in intracellular stimulatory pathways and calcium handling, disruption of tissue structures like the blood-brain barrier (which may allow toxins to enter the brain), impact on vessel and immune functions, and loss of fertility. It should be noted that we are not the only species at jeopardy, practically all animals, plants and bacteria may be at stake. For the latter, Taheri et al (2017) have demonstrated that the exposure to 900 MHz GSM mobile phone radiation and 2.4 GHz radiofrequency radiation emitted from common Wi-Fi routers made *Listeria monocytogenes* and *Escherichia coli* resistant to different antibiotics. To say this finding is "scary" is a classical English understatement.
6. Because the effects are reproducibly observed and links to pathology can not be excluded, the Precautionary Principle should be in force in the implementation of this

new technology within the society. Therefore, policy makers immediately should strictly control exposure by defining biologically-based maximal exposure guidelines also taking into account long-term, non-thermal effects, and including especially vulnerable groups, such as the elderly, the ill, the genetically and/or immunologically challenged, children and foetuses, and persons with the functional impairment electrohypersensitivity (which in Sweden is a fully recognized functional impairment, and therefore receives an annual governmental disability subsidy).

7. So, in essence, science is providing ever more convincing evidence that the radiation emitted by our wireless telecommunications systems can affect biological systems including humans and wildlife. These biological effects are acting even at very low exposure levels.
8. The consequences on health and environment can be all the more serious because:
  - exposure is ubiquitous, repeated and/or prolonged,
  - radiation from wireless technologies is modulated, pulsed, polarized,
  - some individuals may be more vulnerable (foetuses, children, sick patients,...), and/or the effects being much more prolonged (foetuses, children),
  - exposure is combined with other pollutants (e.g. chemical pollutants).
9. Damages on health and environment are already noticeable at exposure levels similar to those that are currently met in the UK.
10. It is clearly not enough just to ensure exposure levels are below WHO recommended levels. WHO recommendations are designed to protect cells from excessive temperature increase successive to a maximal 30 minutes exposure to radiofrequency/microwave radiations. The bases for these recommendations were established in the late 1990s and have not been revised since then, even though:
  - wireless technologies have developed very rapidly over the past 20 years,
  - exposure pattern has completely changed (ubiquitous, repeated, prolonged exposure, exposure of children, foetuses, etc.)
  - considerable scientific progress has been made in the identification of biological and health effects.
11. Not everyone agrees on the question of absolute proof of damage because a certain number of unknowns remain, even at the scientific level. But there is no point using the fact that not all the grey areas have yet been dispelled to assert that there would be no health and environmental effects caused by the widespread deployment of wireless devices and networks.
12. To date, we can no longer deny that thousands and thousands of studies indicate very real effects. The unbridled development of wireless systems is, in the more or less short term, conflicting with health and protection of ecosystems. Observations and return on experience indicate that damages are already in action.
13. I would like to remind you that, in 2011, the World Health Organization classified the radiofrequency and microwave emissions of wireless technologies as possible carcinogens. However, cancer is only one of the long-term consequences of prolonged exposure. Radiofrequency radiation affects our cells long before cancer develops. Our body reacts with oxidative stress and inflammatory processes. When the exposure is

repeated or prolonged, these mechanisms are maintained and may cause sleep disorders, disturbances in cognitive and reproductive functions, damage to cells and DNA. In the long run, the body's defence systems are being exhausted and diseases are threatening:

- repeated infections,
- infertility,
- developmental disorders (e. g. embryonic),
- neurological and neuropsychiatric disorders,
- cardiovascular diseases,
- neurodegenerative diseases including Alzheimer's disease,
- cancers.

14. Foetuses, children, are particularly affected because they may be more vulnerable, and/or the effects being much more prolonged. Also they form the only basis for the future of mankind.
15. Every generation of wireless technology also swells the ranks of electrohypersensitive people who physically suffer from being exposed to electromagnetic radiations, whether or not they are aware of their electrohypersensitivity. Nocebo or psychological explanations are clearly not sufficient to explain the phenomenon.
16. Deploying 5G in addition to existing technologies, for sure, will increase the exposure of the UK's population. But beyond the additional layer of electromagnetic pollution it will constitute, there is strong suspicion that 5G, because of its technological specificities (frequencies, modulations, pulsations, narrowly focused and directional beams, densification of the antenna networks), will present even more serious health and environmental risks than existing technologies.
17. Engineers and the telecom industry readily argue that there is nothing to worry about because the high-frequency radiation of 5G will be absorbed mainly at the periphery of the body. This is based on the presumed skin characteristic that the higher the frequency of radiation, the shallower the depth of radiation penetration. In other words, most of the electromagnetic absorption (and heating) would occur over the first few millimetres of the body's surface.
18. Concluding that there is no risk is forgetting that surface effects can be significant on external cells and tissues (skin, eyes for example), as well as on all blood cells which will pass the outer portion of the skin each five minutes. There are reasons to suspect that the deployment of 5G may be accompanied by an increase in the number of melanomas and other skin cancers, and eye disorders. Finally, from practical tests, no such shielding effect has been demonstrated pointing to that the penetration is, after all, total.
19. But not only surface effects are of concern. There is also strong suspicion that 5G radiation can have impacts far beyond the peripheral layers of the body. Living materials are not just homogeneous and inert conductive materials. It is a major mistake to omit the complexity of biological systems capable of responding to external electromagnetic stimuli otherwise than just through heating. Electromagnetic disturbances and chemical mediators (e.g. inflammatory mediators) can be spread throughout the body and induce biological (non-thermal) effects deep into the body.

Such disturbances will also have an ideal avenue of spread via the peripheral nerves, the latter being found as superficial as 20-40 µm from the outer surface.

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21. One should also remember that Professor Paolo Vecchia, head of ICNIRP at the time, at a conference at the Royal Society in London, said this in 2008 about using ICNIRP's technical guidelines:

22. "What they are not:

23. Mandatory prescriptions for safety

24. The "last word" on the issue

25. Defensive walls for industry or others"

26. (verbatim quote from voice recording)

27. He strongly emphasized that the ICNIRP guidelines are only technical in nature, and never were intended to be used as safety recommendations for medical issues or biological ones.

28. Furthermore, it should be noted that only one hygienic safety value ever has been proposed: 0.0000000001-0.000000000001 µW/m<sup>2</sup> – this is the natural background during normal cosmic activities; proposed by myself at a trade union meeting in Stockholm, already in 1997 (i.e. one year before the publication of ICNIRP's 1998 paper), as a **genuine hygienic safety value**, and since then many times repeatedly presented. (Given the highly artificial nature of the current wireless communication signals, e.g. of their pulsations and modulations, it may actually boil down to 0 (zero) µW/cm<sup>2</sup> as the true safe level.) And do not ever believe it is possible to play it "safer" by only somewhat reducing the exposure levels! (cf. Johansson O, "To understand adverse health effects of artificial electromagnetic fields... ..is "rocket science" needed or just common sense?", In: Essays on Consciousness – Towards a New Paradigm (ed. I. Fredriksson), Balboa Press, Bloomington, IN, USA, 2018, pp 1-38, ISBN 978-1-9822-0811-0). Ironically, this means that even a Precautionary Principle – if it is not firm enough – may not prove precautionary at all. Instead it could lead to the classical "Late lessons from early warnings" or to my quote "Too late lessons from early warnings"... (Are you prepared to risk that for a set of toys, rather than life necessities..?)

29. So to believe that one single 6-, 10-, or 30-minute exposure of a fluid-filled plastic doll, in an otherwise completely radiation-free environment, only calculating acute heating effects, will be any form of safety measure is more than naive. It is dangerously naive.

30. The big players, like the WHO, the radiation protection authorities, the telecom manufacturers, the telecom operators, the insurance and the reinsurance industry are not naive, and they have therefore - legally - all 'abandoned ship', some more than 20 years ago, leaving the consumers and their parliaments and governments completely behind on a ship that floats helplessly around. The big player's decisions are far more telling than any test tube, mice or rat experiments I can show you, and it is therefore very high time to call these big players back. They sold us this "safe" ship, and now

they need to prove that it actually is. And also for the other G:s, like 2G, 3G and 4G, and the upcoming 6G and 7G.

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32. All living beings are electrosensitive! And given the extraordinary electromagnetic sensitivity of living systems, it is not a surprise that they can be affected even at lower exposure levels, especially if the exposure is ubiquitous and prolonged. And the exposure levels, as you know, are not "low" - compared to the natural background of such frequencies the man-made ones come at colossal, astronomical, biblical levels; just the current 3G systems are allowed at a maximal exposure level of 1,000,000,000,000,000,000 times the natural background!

33. All around the world dramatic reductions in pollinating insect populations are noted, for instance in Germany where more than 75% of them are just gone. I am particularly concerned about this because I already have a number of papers in my files dealing with this angle; I have even recently written a short commentary based on them: Johansson O, "To bee, or not to bee, that is the five "G" question", Newsvoice.se 28/5, 2019, <https://newsvoice.se/2019/05/5g-question-olle-johansson/>. I also know that other areas around the world have reported similar huge bee colony collapses, and my strong efforts now is to seek ways to conserve, protect and enhance our pollinators, wherever they reside, and thus conserve, protect and enhance ourselves. If we do not engage, then we certainly may head towards a moment in history where future generations - if any - will ask us "*Why didn't you react and act?*"

34. Existing wireless technologies are increasingly charged because of the major risks they pose to health and environment. As a result, I support your concerned citizens in their demand for taking all necessary measures to halt the deployment of 5G and reduce the overall exposure levels.

35. I suggest you act before it is too late.

36. The UK Parliament has an incredible opportunity to protect the public now and work with industry to bring biologically safe technology to market. You are part of the future, and this time in another moral-ethical realm. And remember this issue is *not* about the sun, it is about adverse health and biological effects of *artificial* electromagnetic fields.

37. Thank you for your time and consideration, please do not hesitate to contact me if I can provide additional information, complete scientific references, or presenting a lecture to you and your highly esteemed colleagues, both at the national as well as at the local level.

Respectfully, Stockholm, March 16, 2020  
Olle Johansson  
Professor, PhD

March 2020