Frequencies used in Telecommunications
An Integrated Radiobiological Assessment

Yuri G. Grigoriev
Translated and adapted by the ORSAA* translation team

Professor Yuri G. Grigoriev (PhD, DMedSci) 1925-2021
Chief Scientific Officer, Laboratory of Radiobiology and Hygiene of Non-Ionizing Radiation, Burnasyan Federal Medical Biophysical Center of the Federal Medical Biological Agency (Russia); Academician, Academy of Electro-Technical Sciences (Russia); Deputy Chair, Bureau of Radiobiology, Russian Academy of Sciences; member of the WHO Advisory Committee (International EMF Project); Member of the Russian Scientific Commission on Radiation Protection; Member of the Russian National Committee on Non-Ionizing Radiation Protection; Member of the International Commission for Electromagnetic Safety.

*ORSAA is the Oceania Radiofrequency Scientific Advisory Association Inc (www.orsaa.org). ORSAA is a not-for-profit group of independent researchers investigating the biological and health effects of man-made electromagnetic fields and radiation. ORSAA has collated the world's largest online database of papers published this area (ODEB). Over two thirds of the published, peer reviewed papers show effects. ORSAA was asked by Yuri to help translate his book from Russian into English, and so the ORSAA translation team worked with Yuri on this task in the last six months prior to his passing. The team has taken the original work and adapted it for English readers, altering the structure of sections and adding explanations where necessary, but always staying true to the science and the meaning that Yuri was trying to convey. Yuri was extremely passionate about getting this message out to the world, a message that he had spent a lifetime researching. It is the hope of the ORSAA team that these pages live up to Yuri's wishes for his book.

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Foreword by ORSAA

(Oceania Radiofrequency Scientific Advisory Association)

This book brings a timely warning message to a world intent on further densification of background artificial electromagnetic fields (EMFs) to the point of saturating the planet. The current level of human-made EMF already sits at a quintillion (10^{18}) times the earth's natural background levels. These levels continue to rise in spite of very limited biological testing and the many warnings from independent scientists over the last five decades. Ubiquitous 5G is now to be added to the existing 3G and 4G systems, covering the earth and sky, and invading the ionosphere.

Artificial radiofrequency (RF) radiation has already been shown to be a potentially carcinogenic agent, damaging to DNA and creating many other biological and health effects.

ORSAA has assisted with the translation and revision of this book with a view to understanding the reasoning behind the Russian precautionary approach to the roll-out of wireless technology. Sadly, one of the authors, Professor Yuri Grigoriev, a giant in the science of Radiobiology, passed away in the midst of the translation and revision of the book. Over the past seven decades, Professor Grigoriev orchestrated many large-scale experiments and practical projects in ionizing and non-ionizing radiation science and protection. The output of this work has been used in health care, medical science, the military, and in space research. Grigoriev's breadth and depth of understanding of the interactions between biology and physics should not be ignored by governments, telecommunications engineers or social scientists charged with responsible decision-making in this matter. ORSAA has considered it both an honour and a duty to complete this project, in fulfillment of his urgent wishes.

Professor Grigoriev was privy to many decades of research regarding non-ionizing radiation in Russia and the Eastern bloc countries. The reader is herein given access and insight into results from these studies. It becomes clearer with each turn of the page that these research results corroborate and amplify the many warning messages of biological harm revealed in the enormous database of scientific studies already available to the West, from military studies beginning in the 70s to sound biophysics of the 80s, and decades of independent research from universities and other institutions.

In these pages the authors describe the biophysics of exposures to EMF using clear explanations and solid logic. The industry premise that 5G millimetre waves (which are characterized by complex modulations) will only be absorbed in the skin and thereby only increase surface heating, is revealed to be shallow and false. As the book explains, the skin is a major critical organ of the body when it comes to millimetre wave exposures. It is rich in nerves, and innervated by the peripheral nervous system, including the autonomic nervous system. The skin is also the body's first line of defence against chemical or mechanical assault. Concerns are also raised for the cornea and sclera of the eyes, for which there is no current relevant experimental data.

The many decades of work in Russia and Eastern bloc countries on bio-resonance have provided a qualitative shift in understanding the interactions between MMW signals and human systems. Use of bio-resonance as a framework has allowed for the integration of seemingly puzzling results from various corners such as the discovery of amplitude and frequency "windows" and non-linear dose-response characteristics. Both experimental and theoretical work regarding bio-resonance is reviewed within this text. Included in this work is evidence for mechanisms in the body and the immune system that specifically recognise various forms of MMW radiation. These systems are changed as a result of their interactions with MMWs, and moreover, they accumulate bioeffects.

These bio-resonance findings provide principles of immense significance for better understanding of the immune system and human sensitivity to EMFs. Such principles are now being developed in Western medicine and safety science; e.g., Geesink and Meijer (2020) have used bio-resonance and quantum coherence in order to provide a framework for explaining why experimentally observed effects are dependent on frequency bands and power density. A better understanding of bio-resonance could assist microwave technology to move out from the

currently unhealthy situation and into safer, more bio-compatible systems. Exploration of bio-resonance effects may also open up new methods for healing, thereby creating a qualitative shift in medical science.

The authors have taken an approach to radiation protection that prioritises the health and safety of the population, including more vulnerable exposure groups such as children. The Russian scientists point out that our current exposures to RF, although deemed by western authorities to be "low-power", are ongoing, 24 hours per day, seven days a week, and are biologically active. Therefore, these anthropogenic electromagnetic energy exposures cannot be considered to be risk free, particularly for more vulnerable population groups. Their approach is in stark contrast to the approach taken by ICNIRP, FCC (US), and ARPANSA (Australia). Unfortunately for humankind, these organizations, which are responsible for our protection, require conclusive proof of harm before they will acknowledge the risks. The International Commission on Non-Ionizing Radiation Protection (ICNIRP) is a self-appointed non-governmental agency, which stands accused of having major conflicts of interest, and where the membership selection process is shrouded in secrecy. ICNIRP continues to ignore long-term non-thermal bioeffects in setting their guidelines, and it is these guidelines that are used in the West to set global standards which have allowed industry to proceed unencumbered by any real safety regulations.

We gratefully acknowledge the academic and organizational work of ORSAA's retired radiation health physicist, Victor Leach, as well as the team of editors and other professionals who have worked tirelessly to bring this revised and translated version of the original Russian book to fruition. We recommend this text as an enlightening read for those concerned with the health implications of man-made microwave radiation, including 5G signals.

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Original Russian Foreword

In Russia, as in many countries, there have been active discussions over the past few years about a promising proposal for optimizing cellular communications. This has culminated in the worldwide implementation of the new 5G technological standard which will guarantee fast transmission of vast amounts of data. For this purpose, millimeter wave (MMW) electromagnetic radiation will be used.

The techno-economic advantages are far-reaching and widely reported by the media around the world. However, the degree of risk this type of electromagnetic radiation poses to public health and the environment remains unclear.

Scientists and medical professionals have appealed to the United Nations and the European Union regarding the necessity for preliminary medical and biological research before implementing the 5G standard. Unfortunately, these appeals have not been acted upon. A number of countries who question the need for the 5G implementation are pondering the health consequences of the densification of EMF pollution.

This book by Yuri. G. Grigoriev, et.al, *The 5G Health Risk– An Integrated Radiobiological Assessment,* examines the potential health implications of the implementation of the 5G standard within the cellular communication system. In contrast to the already existing 2G, 3G and 4G wireless technologies, which use electromagnetic fields in the *radio* frequency range, the 5G standard additionally utilizes *millimetre waves* to incorporate the network connections of the Internet of Things (IoT).

In order to ensure the stable delivery of MMWs to cover the entire territory of our planet, Earth satellites are used. The launch of 4,425 satellites has been planned to implement the provision of universal Internet access. There are already 800 satellites in space under this program.

As a result, the entire population of the earth will be trapped for life in an electromagnetic grid of millimetre waves and no one will be able to avoid their impact.

It should be noted that there are currently several thousand satellites in orbit. This fact is of great concern to astronomers (in the context of light pollution) and also for space agencies regarding the safe service of personnel on space flights in Russia. Space junk (debris) is a major problem as collisions create an ever-increasing number of high velocity projectiles that could threaten global communications. Debris larger than the size of a tennis ball is currently being tracked, however, NASA has reported over 500,000 untracked objects.

MMWs, unlike the current microwave frequencies used for 4G communication, are easily blocked by objects. In practice, to cover a certain area with a millimeter cell, you will need to increase the number of base stations (BS). For example, if the cell radius is only 20 meters, you will need about 800 base stations per square kilometre, located three to five meters from the consumer. This is in sharp contrast, for example, with 3G and 4G requirements, which use large cells and have ranges from 2 to 15 km or more.

Since millimetre waves are absorbed in body tissue at a depth of up to 2 mm, only the skin and sclera (white section) of the eye will be affected by them. The authors therefore correctly believe that when assessing the risk of MMW exposures, it is necessary to take into account the presence of two new critical organs, the skin and the eyes. The skin is a very complex biostructure. It is the largest organ in the body and has a large number of receptors. Skin acts as a "bio-relay" between the external environment and the functional state of the body.

Naturally, the introduction of 5G technology in the communications system raises new questions. Firstly, there are the technical requirements for the successful use of this type of communication: a significantly larger number of micro-antenna base stations (i.e., antennas) per unit area with satellite support is needed. Secondly, there is the lack of a consistent methodology for health and safety. Thirdly, thus far, there are only *assumptions* about the possible biological effects of a lifetime of exposure to MMWs on human populations and ecosystems. There is no long-term data on possible health effects from constant exposure to MMWs on the skin and sclera of the eyes. Targeted research or pre-market testing has not been performed in Russia or other countries prior to implementation of this new technology.

There are different perspectives on the assessment of the potential hazards of this new technology. The International Commission on Non-ionizing Radiation Protection (ICNIRP) and the US Federal Communications Commission (FCC) assess risk by considering only the additional absorbed dose of electromagnetic thermal energy, according to the pre-existing radiofrequency (RF) standards. This additional dose is considered insignificant (in terms of energy transfer) and therefore the existing FCC and ICNIRP standards, approved back in 1996, are not being materially revised to include other non-thermal emerging potential health aspects. International standards, despite the criticism of the scientific community and the European Union, have remained unchanged for more than 20 years.

The authors of this book assert that the ICNIRP approach is in error since the radiation loads on new critical organs (the skin and the eyes) are not taken into account. The authors contend that the significance of radiobiological criteria and the degree of risk from the emergence of the new critical organs *must* be considered; in particular, the load on existing critical organs and systems, with a view to lifetime exposure of the population to electromagnetic fields (EMFs). From this point of view, this book presents an assessment of the total radiobiological danger of planetary electromagnetic radiation exposure to the population.

The book offers the reader new ways to reduce the electromagnetic load, taking into consideration 5G exposures on the human population. It is necessary to explain to the public that radiofrequency electromagnetic radiation can be harmful and that their protection is regulated by certain radiation protection standards. Exposure to EMFs that exceeds these standards may negatively affect the health of the mobile (wireless) communications user. In this regard, the public should strictly follow the existing health and safety recommendations. Most people, however, perceive their wireless devices simply as a convenient part of everyday life, for entertainment, or as a toy for children. They use wireless communications without restriction and do not consider limiting their conversation time. The general public needs to be made aware that they are violating radiation protection recommendations and putting themselves and their children at risk. This danger must be clearly and persistently explained through public health messaging and in the media. It is necessary to introduce the concept of “exposure risk awareness”. Strong consumer protection advice is required but the telecommunications industry, as well as governments, are reluctant to give this advice as it will acknowledge that these devices are not risk-free and could also adversely affect their profits.

To our knowledge this is the first book on 5G that outlines the potential dangers of 5G technology, both in Russia and overseas. The publication of this book is timely.