

Important information for councils regarding 5G

Dear Councillors,

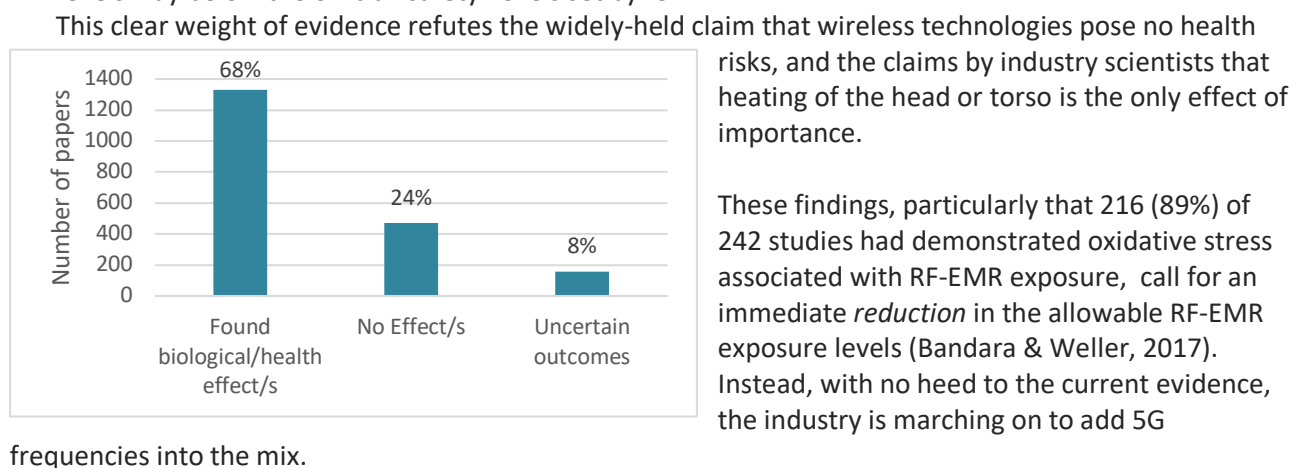
Please consider the important information below compiled by scientists and researchers from the Australian organisation ORSAA¹, in order to provide local councils around Australia with important evidence that needs to be considered when examining the proposed 5G technology.

The evidence for biological harm

ORSAA is the custodian of a huge collection of evidence regarding the health effects of wireless (RF-EMR) technologies. While there are many voices on this issue, the science itself can lay a truthful foundation on which to base deliberations. To this end, ORSAA has established the world's largest freely available categorised database of peer-reviewed scientific research on RF-EMR biological/health effects: www.orsaa.org. This database is intended to facilitate an evidence-based approach to health and risk assessment of wireless technologies. The ORSAA database currently contains over 3000 scientific studies sourced from all over the world. ORSAA is not funded by commercial entities and therefore without any financial conflicts of interests.

The exposure agent associated with 5G is Radio Frequency (RF) radiation which is part of the electromagnetic (EMR) spectrum that uses man made, continuous, pulsed and modulated signals based on frequencies from long AM radio waves through to millimetre length microwaves (just below infra-red and visible light). Based on objective searches from the database, ORSAA has found the following:

1. The weight of evidence clearly shows that exposure to wireless technologies have significant effects on humans, animals and plants. A cross sectional study of 1,955 scientific experimental studies within the ORSAA database (i.e. the laboratory studies and population-based studies examining biological and health effects of RF-EMR exposures) revealed that the majority of papers (68%) showed significant biological or health effects, as summarized in the figure below. Many of these papers used exposure levels way below the official 'safety' levels set by ICNIRP.



¹ The Oceania Radiofrequency Scientific Advisory Association (ORSAA) is the only independent scientific organization in the Australia-New Zealand region investigating the health risks of low-intensity radiofrequency electromagnetic radiation (RF-EMR), mostly microwave range RF-EMR generated for wireless communications and surveillance.

Health Effects

The potential adverse health outcomes of long term, low level exposures to microwave radiation from telecommunications technology are:

Cancer

The entire RF-EMR spectrum (including AM/FM range radio waves, and microwaves including 5G) was classified by the WHO's International Agency for Research on Cancer (IARC) as a Group 2B Possible Carcinogen (2011). The US National Toxicology Program has recently provided clear evidence of carcinogenicity and DNA damage associated with exposure to RF-EMR (National Toxicology Program, 2018; Smith-Roe et al., 2019). The IARC (2019) has recently announced that the effects of RF-EMR need to be re-evaluated with high priority

Other adverse health conditions

Thousands of scientific studies have been conducted over the decades which show biological/health effects of RF-EMR (e.g., EMF-Portal, 2019; Markov, 2018; ORSAA, 2019). ORSAA researchers have used the database capabilities to classify bio-effects from RF-EMR exposures into various "effects" categories such as cardiovascular effects and immune effects. The health effects categories that can be found in the ORSAA database are shown in the table below, which indicates the number of papers showing effects in each category. The results from the database are described in Leach, Weller, and Redmayne (2018).

Find Search Summary Totals					
Peer Reviewed Studies Showing Biological Effects		Number of records used : 2165 of 3448			
Auditory Dysfunction / Hearing loss / Tinnitus	34	Apoptosis (Programmed Cell Death)	95	Brain Tumours	48
Blood Brain Barrier Permeability Changes	15	Breast Cancer	6	Cellular Stress	59
Brain Development / Neuro Degeneration	52	Biochemical Changes	189	EEG changes / Brain Waves	108
Neuro Behavioural Effect / Cognitive Effects	186	Cell Irregularities/ Damage/ Morphological Changes	186	Effects on Mitochondria	40
Calcium Influx / Efflux	20	Fatigue	37	Altered Enzyme Activity / Protein Levels / Protein Damage	361
Circadian Rhythm Disruption	13	Altered Gene Expression	146	Headaches/Migraines	67
DNA Damage / Mutagenic / Genotoxic	149	Altered Glucose Level / Glucose Metabolism	19	Inflammation	23
Endocrine / Hormone Effects	68	Cardiovascular/Vascular Effects	62	Hepatic Effects (Liver)	20
Miscarriage / Spontaneous Abortion / Foetus Resorption	3	Immune System Effects	65	Impaired / Reduced Healing/ Bone Density Changes	6
Memory Impairment	55	Oxidative Stress / ROS/ Free Radicals	246	Speech Impairment	4
Sperm / Testicular Effects	93	Sleep Effects	61	Haematological Effects	49
Tumour Promotion	38	Neurotransmitter Effects	32	Synergistic/Combinative Effects	55
Thyroid Effects	14	Visual Disturbances/ Ocular Effects	40	Autism	8
Leukemia	3	Parotid Gland Malignancy	4	Neoplasia/ Hyperplasia (Abnormal Tissue Growth)	5
Depression	23	Induced Adaptive Response	49	Dizziness / Vertigo / Vestibular Effects	23

 May have a role in disease pathway/ well-being
 A known cause in disease
 Continue

Notable are the large numbers of papers showing potential harm as a result of direct cell damage caused by oxidative stress, a pathological phenomenon which is involved in many chronic diseases such as cancer, heart disease, diabetes and neurodegenerative diseases including Alzheimer's disease as well as mental illnesses. Furthermore, oxidative stress provides a clear mechanism for how existing mobile technologies can cause harm to health, which lays to waste the claims that no scientific mechanism has been found.

...RF-induced genotoxicity is now irrefutable and one underlying mechanism is evidently oxidative stress. Most studies (216 out of 242) that investigated oxidative stress endpoints in light of RF exposure were positive [24]. Excerpt from a recent paper by ORSAA researcher and ORSAA advisor, namely: (Bandara & Carpenter, 2020)

The papers in the main database categories reveal the following major health effects from exposures to RF-EMR:

- neurodevelopmental disorders in children
- neurodegenerative diseases in adults such as dementia, multiple sclerosis, Parkinson's disease
- neuropsychiatric/neurobehavioural problems including memory problems, anxiety, depression, insomnia and resulting fatigue
- lowered fertility and serious damaging effects on reproductive tissue and sperm
- immune diseases/disorders such as allergies, atopic dermatitis and autoimmune diseases
- metabolic diseases arising out of sustained disruption to basic cellular functions such as mitochondrial dysfunction.

This set of biological and psychological conditions mirrors the current epidemic of chronic illnesses that has been growing in the last couple of decades in the developed world. While there are other contributors to the environmental toxic burden, exposures to man-made EMR/EMF has increased exponentially due to the rapid expansion of wireless technology. This makes RF-EMR a likely causal factor in the marked decline in health occurring in the Western world (e.g., Blue Cross Blue Shield, 2019).

Evidence for health effects from 5G frequencies

While the existing large volume of scientific studies show clear health risks with the frequencies used in the first phase of 5G deployment, very little research has been done so far on the health effects of millimetre waves to be used for the second phase of 5G (6 to 86 GHz). The existing review papers (Oughton, Frias, Russell, Sicker, & Cleevly, 2018; Russell, 2018) reveal the current known effects of these waves:

- 1 Despite shallow penetration (compared to lower frequencies) 5G millimetre waves pose possible harm to the largest organ of the body, the skin, with the possibility of permanent tissue damage (Neufeld & Kuster, 2018).
- 2 Effects on eyes (including cataracts), heart rate, immune system and DNA have been shown.
- 3 Millimetre waves can also affect important components of skin such as nerves, immune cells, blood vessels causing systemic effects involving internal organs. It has been found that sweat ducts of skin act as helical antennae for millimetre waves.
- 4 Extra, damaging 'Brillouin Precursors' may be induced in the human body. A Brillouin precursor is an induced radiation pulse that can be created by extremely fast data transmission rates, which can be achieved with 5G transmissions. When such a pulse enters the human body, it has the potential to generate a burst of energy that can travel much deeper than predicted by conventional models used for standard setting. Considering the planned massive rollout of 5G mmWave antennas, many close to homes and workplaces, this constitutes a possible significant public health hazard which has not yet been investigated. (Albanese, Blaschak, Medina, & Penn, 1994; Xiao & Oughstun, 1999).

Harm to birds, insects and plants

Microwave radiation is already having effects on birds, bees and pollinators (Bandara & Carpenter, 2018; Lázaro et al., 2016; Warnke, 2009), for example disruption of magnetic based orientation in migratory birds (Engels et al., 2014). Moreover, insects will maximally absorb 5G radiation due to the length of their bodies being measured in millimetres and the subsequent resonance effects (Thielens et al., 2018). Therefore, 5G radiation could have catastrophic effects on the already endangered insect populations worldwide, which has implications for agriculture and for global food supplies. Furthermore, there is some evidence indicating that microwave radiation may injure trees in line of sight of a tower (Waldmann-Selsam, Balmori-de la Puente, Breunig, & Balmori, 2016). The placement of extensive number of 5G mini-cells in suburbia is therefore likely to be extremely detrimental to life-sustaining vegetation.

More on the effects of 5G on the environment can be found at <https://ehtrust.org/climate-change-and-5g/>

Effects on the earth's atmosphere

Together, the earth, the ionosphere and the lower atmosphere form a global electric circuit that controls the biological rhythms of humans, birds and animals. These rhythms are essential for life, affecting blood pressure, the sleep-wake cycle, reproductive, cardiac, and neurological systems. To enable 5G, tens of thousands of satellites will be placed in both the ionosphere and magnetosphere, sending signals at millions of watts. When these powerful man-made signals are imposed on the natural background EMFs they are likely to alter the electromagnetic environment significantly, and may be very damaging to all life on earth (Firstenberg, 2018). In addition, the engineering literature is clear that the high frequency waves proposed for stage 2 of 5G communications will create quantum level changes in the rotational energy of water (at 22.3GHz, 33GHz, 323 GHz) and oxygen molecules (at 60 GHz). Given these molecules are the basis of life, the effects of altering the fundamental characteristics of water and oxygen are likely to be inimical to life on earth.

Unsustainable: significant increases in energy burden promoting global warming

The Centre for Energy Efficient Communications White Paper (2015) points out that wireless systems use 15 to 23 times more energy than wired systems, and that up to 90% of this energy is used by wireless network technologies.

Wireless technologies will continue to consume at least 10 times more power than wired technologies when providing comparable access rates and traffic volumes. (Baliga, Ayre, Hinton, & Tucker, 2011)

The average iPhone uses more energy than a midsize refrigerator, says a new paper by Mark Mills, CEO of Digital Power Group, a tech investment advisory. A midsize refrigerator that qualifies for the Environmental Protection Agency's Energy Star rating uses about 322 kW-h a year, while your iPhone uses about 361 kW-h if you stack up wireless connections, data usage, and battery charging (Lobello, 2013) (Schoechle, 2018 p. 71).

While industry expects that each 5G device will use less power, it also expects that there will be millions more connections and devices. *...5G is expected to require far more base stations to deliver service and connect billions of mobile and IoT devices ... 5G could also consume up to 1,000 times as much energy* <https://spectrum.ieee.org/telecom/wireless/5gs-waveform-is-a-battery-vampire> .

Furthermore, according to China Mobile, 5G needs three times the number of base stations for the same coverage as LTE, and the power consumption of one 5G base station is three times the power consumption of 4G LTE (Jones, 2019). A recent survey by Vertiv (2019) found that 5G technology will likely increase total network energy consumption by 150 to 170 per cent by 2026. *"... 5G is going to be significantly more energy-intensive than previous generations of wireless connectivity"*. See Maisch (2019) for a full summary of this report.

The Jevons Paradox of environmental economics is relevant here. That is, although technological progress increases the efficiency with which a resource is used (if each individual mobile device did use less power under 5G), demand and consumption will increase (there will be thousands more towers and devices in every neighbourhood, using thousands of times more energy). So overall, the energy and resource consumptions cost of 5G will be far greater than existing systems. With humankind facing a global warming and global energy crisis, the move to expand energy consumption for more unnecessary technology is both reckless and irresponsible.

The deployment of 5G is not financially secure

The engineering literature on 5G raises concerns about the ability of industry to finance 5G deployments and infrastructure. As well as the increased costs of energy consumption, 5G base stations cost four times the price of LTE (Jones, 2019). It appears that the **push to encourage 5G cities and the driverless car industry is a strategy by industry to bring countries on board in order to cover the costs of 5G deployment:**

*...small cell deployments provide significant capacity but at considerable cost, and hence are likely only in the densest locations, unless MNOs can **boost revenues by capturing value from the Internet of Things (IoT), Smart Cities or other technological developments** dependent on digital connectivity. (Oughton et al., 2018 p.1.)*

This issue has been raised by the ex-CEO of Internet Australia (Patton, 2019).

Productivity: An unhealthy population would significantly impact a country's economy and social structure.

Public Awareness about the effects of 5G.

The radiation protection authorities who are pivotal in determining government and industry standards internationally rely on the advice from the International Commission for Non-Ionising Radiation Protection (ICNIRP), a panel of 13 individuals which is mostly made up of physicists and engineers who are not qualified to make judgments on biological effects. They have ignored a large body of scientific evidence showing biological effects induced by exposures well below their guidelines while holding on to their obsolete dogma that only thermal effects (tissue heating) can occur with RF-EMR which their guidelines can prevent. Furthermore, most of the present and past ICNIRP members have strong financial ties with the industry, even though ICNIRP claims to be an independent organisation. Many government regulatory bodies use the ICNIRP guidelines with similar conflicts of interest occur within each country. The spin on EMR science and manipulation by industry at all levels as documented in Maisch (2017).

The result is that these influential but compromised regulatory bodies have dictated inadequate public exposure regulation within their own jurisdictions. The weighty positions taken by these organisations do not give credence to the vast body of evidence from other disciplines such as biochemistry, physiology and biophysics, indicating that there are serious, non-thermal biological effects of low-intensity RF-EMR. ORSAA researchers have recently written about this issue (see Weller, Leach, & May, 2019) [Excerpts from p. 1 to 5 below]

... Because these bio-effects defy traditional thinking that the energy from low-level RF non-ionizing radiation is too insignificant to cause direct cell damage, they do not appear to be taken seriously [ICNIRP, 2002]. Non-ionizing radiation may not have sufficient energy to knock electrons off from atoms, but it can affect molecular structures and interfere with metabolic processes as evidenced by the categorized biological effects noted in the ORSAA database [Leach et al., 2018].

...There are two main factors that trigger the precautionary approach: the strength or balance of evidence, and the potential cost of doing nothing.

Also see Bandara, Leach, and Weller (2018)

We reiterate our claims of inaccuracy and misrepresentation of the available scientific evidence on radiofrequency electromagnetic radiation (RF-EMR) by ARPANSA, particularly in their main report TRS-164

Unfortunately, due to long-running highly concerted systematic attempts by vested interests to obfuscate the scientific information on a global scale, the public and local authorities are not being informed of the consequences of RF-EMR exposures. Instead of putting resources behind testing for biological effects, government and industry are jointly campaigning to reassure the public that 5G is safe.

In the long-term, this coverup will be detrimental to the health and wellbeing of the world.

Please see Dr Magda Havas clear and rational explanation of what 5G means from a research scientist's perspective <https://www.youtube.com/watch?v=Vh8DNKmDGk0&t=18s>

Summary and Recommendations

ORSAA's major concern is the evident harm to the mental and physical health of the current and next generations, as well as the likely harm that is forecast by experienced scientists in this field for ecosystems and our planetary stability.

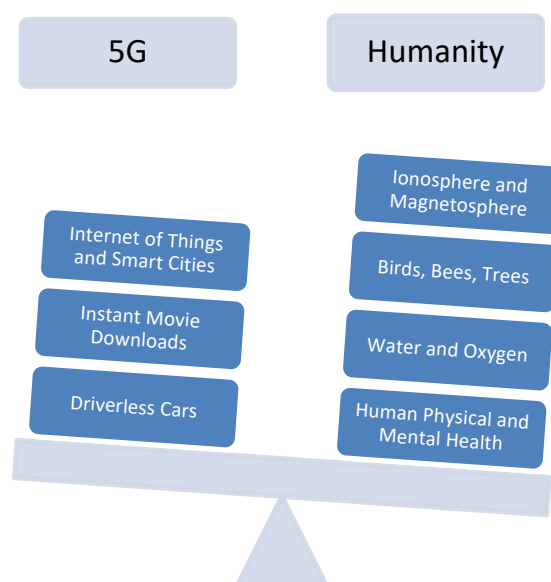
In the balance are the needs of industry to promote its own growth and development and the push to 'innovate' versus the serious risks to humans and the planet. We recommend the council considers what is in the balance, and its responsibility to protect people and the environment.

ORSAA offers our cooperation and assistance with councils in their investigation into 5G and look forward to hearing from your council concerning any of the above issues that we have raised.

Yours sincerely,

Dr. Julie McCredden

ORSAA President info@orsaa.org www.orsaa.org



References

- Albanese, R., Blaschak, J., Medina, R., & Penn, J. (1994). *Ultrashort electromagnetic signals: Biophysical questions, safety issues and medical opportunities*. Retrieved from
- Baliga, J., Ayre, R., Hinton, K., & Tucker, R. S. (2011). Energy consumption in wired and wireless access networks. *IEEE Communications Magazine*, 49(6), 70-77.
- Bandara, P., & Carpenter, D. O. (2018). Planetary electromagnetic pollution: it is time to assess its impact. *The Lancet Planetary Health*, 2(12), e512-e514.
- Bandara, P., & Carpenter, D. O. (2020). Causes of cancer: Perceptions vs. the scientific evidence. *European Journal of Cancer*, 124, 214-216.
- Bandara, P., Leach, V., & Weller, S. (2018). Health risks of wireless technologies. Authors' Response to the Letter to the Editor. *Radiation Protection in Australasia* 35(2), 22-26.
- Bandara, P., & Weller, S. (2017). Biological effects of low-intensity radiofrequency electromagnetic radiation—time for a paradigm shift in regulation of public exposure. *Radiat Protect Australas*, 34, 2-6.
- Blue Cross Blue Shield. (2019). *The Health of Millennials*. Retrieved from <https://www.bcbs.com/the-health-of-america/reports/the-health-of-millennials>
- Centre for Energy Efficient Communications. (2015). *The power of wireless cloud*. Retrieved from <https://ceet.unimelb.edu.au/publications/ceet-white-paper-wireless-cloud.pdf>
- EMF-Portal. (2019). Retrieved from <https://www.emf-portal.org/en>
- Engels, S., Schneider, N.-L., Lefeldt, N., Hein, C. M., Zapka, M., Michalik, A., . . . Mouritsen, H. (2014). Anthropogenic electromagnetic noise disrupts magnetic compass orientation in a migratory bird. *Nature*, 509(7500), 353.
- Firstenberg, A. (2018). International Appeal: Stop 5G on earth and in space. Retrieved from <https://www.5gspaceappeal.org/about>
- International Agency for Research on Cancer. (2011). IARC classifies radiofrequency electromagnetic fields as possibly carcinogenic to humans [Press release]. Retrieved from https://www.iarc.fr/wp-content/uploads/2018/07/pr208_E.pdf
- International Agency for Research on Cancer. (2019). Advisory Group recommendations on priorities for the IARC Monographs. *The Lancet Oncology*, April. Retrieved from <https://www.thelancet.com/action/showPdf?pii=S1470-2045%2819%2930246-3>

- Jones, D. (2019). Power Consumption: 5G Basestations Are Hungry, Hungry Hippos [Press release]. Retrieved from <https://www.lightreading.com/mobile/5g/power-consumption-5g-basestations-are-hungry-hungry-hippos/d/d-id/749979>
- Lázaro, A., Chroni, A., Tschulin, T., Devalez, J., Matsoukas, C., & Petanidou, T. (2016). Electromagnetic radiation of mobile telecommunication antennas affects the abundance and composition of wild pollinators. *Journal of insect conservation*, 20(2), 315-324.
- Leach, V., Weller, S., & Redmayne, M. (2018). A novel database of bio-effects from non-ionizing radiation. *Reviews on environmental health*, 33(3), 273-280.
- Maisch, D. (2017). Spin in the Antipodes: A history of industry involvement in telecommunications health research in Australia. In M. J. Walker & L. Hardell (Eds.), *Corporate Ties That Bind: An Examination of Corporate Manipulation and Vested Interests in Public Health*. New York: Skyhorse Publishing.
- Maisch, D. (2019). 5G: Eco-Energy or Energy Monster. Retrieved from <https://www.emfacts.com/2019/06/5g-eco-energy-or-energy-monster/>
- Markov, M. (2018). *Mobile Communications and Public Health*: CRC Press.
- National Toxicology Program. (2018). *High exposure to radio frequency radiation associated with cancer in male rats*. Retrieved from <https://www.nih.gov/news-events/news-releases/high-exposure-radio-frequency-radiation-associated-cancer-male-rats>
- Neufeld, E., & Kuster, N. (2018). Systematic derivation of safety limits for time-varying 5G radiofrequency exposure based on analytical models and thermal dose. *Health physics*, 115(6), 705-711.
- ORSAA. (2019). Retrieved from <https://www.orsaa.org/orsaa-database.html>
- Oughton, E., Frias, Z., Russell, T., Sicker, D., & Cleevly, D. D. (2018). Towards 5G: Scenario-based assessment of the future supply and demand for mobile telecommunications infrastructure. *Technological Forecasting and Social Change*, 133, 141-155.
- Patton, L. (2019). My New Year's Resolution – Keep fighting for #BetterBroadband. Retrieved from <http://theluckygeneral.biz/2019/01/06/my-new-years-resolution-keep-fighting-for-betterbroadband/>
- Russell, C. L. (2018). 5 G wireless telecommunications expansion: Public health and environmental implications. *Environmental research*, 165, 484-495.
- Schoechele, T. (2018). Re-Inventing Wires: The Future of Landlines and Networks.
- Smith-Roe, S. L., Wyde, M. E., Stout, M. D., Winters, J. W., Hobbs, C. A., Shepard, K. G., . . . Tice, R. R. (2019). Evaluation of the genotoxicity of cell phone radiofrequency radiation in male and female rats and mice following subchronic exposure. *Environmental and molecular mutagenesis*.
- Thielens, A., Bell, D., Mortimore, D. B., Greco, M. K., Martens, L., & Joseph, W. (2018). Exposure of insects to radio-frequency electromagnetic fields from 2 to 120 GHz. *Scientific reports*, 8(1), 3924. Retrieved from <https://www.nature.com/articles/s41598-018-22271-3.pdf>
- Vertiv. (2019). *5G: The Risks and Rewards for Operators*. Retrieved from <https://www.vertiv.com/en-asia/about/news-and-insights/articles/white-papers/5g-the-risks-and-rewards-for-operators/>
- Waldmann-Selsam, C., Balmori-de la Puente, A., Breunig, H., & Balmori, A. (2016). Radiofrequency radiation injures trees around mobile phone base stations. *Science of the Total Environment*, 572, 554-569.
- Warnke, U. (2009). *Bees, Birds and Mankind: Destroying Nature by "electrosmog"*: E. Oppenheimer and Sons.
- Weller, S., Leach, V., & May, M. (2020). Comment on Letter: "Post-Normal Science and the Management of Uncertainty in Bioelectromagnetic Controversies" by AW Wood. *Bioelectromagnetics*, 41(1), 80-84.
- Xiao, H., & Oughstun, K. E. (1999). Failure of the group-velocity description for ultrawideband pulse propagation in a causally dispersive, absorptive dielectric. *JOSA B*, 16(10), 1773-1785.