
Canadians For Safe Technology, (C4ST) Presentation June 2023

ICNIRP WIRELESS RADIATION GUIDELINES ARE IN NEED OF URGENT REVIEW

Reaching the trigger point for adopting a proper Precautionary Approach to exposures from new wireless technologies.

VICTOR LEACH (APP PHYSICS RMIT, MSC MELB. UNI.)

50 YEARS OF RADIATION PROTECTION EXPERIENCE (1972-2019)



My Discovery of RF-Non Ionizing Radiation (NIR) guidelines

- Most Radiation Protection practitioners work in Ionizing Radiation and assume that ICRP's philosophy has been adopted by ICNIRP for Non-Ionizing Radiation.
- Radiation Safety Advisor at QUT and UQ: people claiming to be sick around wireless devices.
- ARPANSA official position: claim health issues not established – symptoms likely psychosomatic.
- Purchased a spectrum analyzer and measured RF power density levels in various locations:
- Found that:
 - 6 and 30-minute averages are very of limited value. Peak values can disturb biological processes. By averaging, these instantaneous processes these effects are ignored.
 - levels were very variable and depended on wireless communication traffic;
 - ICNIRP/ARPANSA guidelines were based on short-term heating not applicable to 24/7 exposure of general populations;
 - the precautionary principle was not being used.

FAILURE TO ADVISE THE PUBLIC OF RISKS LEADS TO A RISE IN AVOIDABLE DISEASES

Events such as this one could have been avoided if the public had been informed of risks presented by medical experts ([West et al. 2013](#))

Message is simple:

Do not carry a cell phone in your bra or pocket.

Why? Because research shows RF exposure causes DNA damage and is also likely to be cancer-promoting – evidence strengthened recently by US and German gov. funded studies ([NTP data 2016](#), [Lerchl et al. 2015](#))

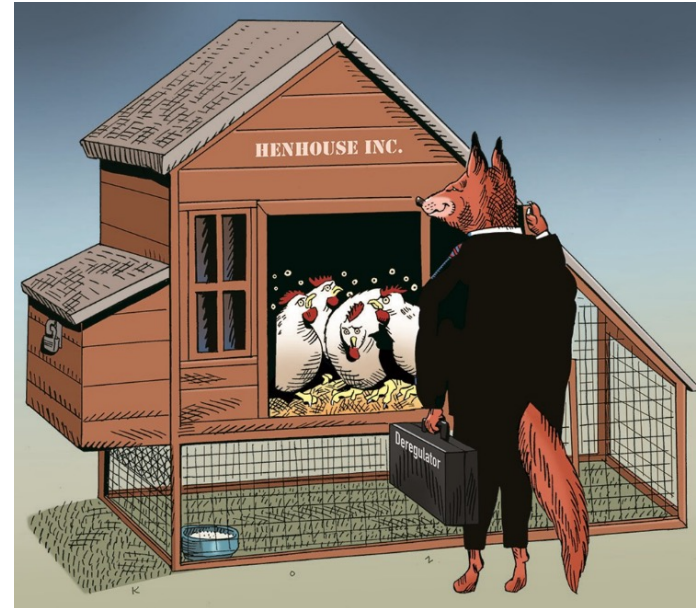
No consumer advice on the safe use of these devices

Rachel compares her cell phone to the area in her breast marked for her boost dose of radiation

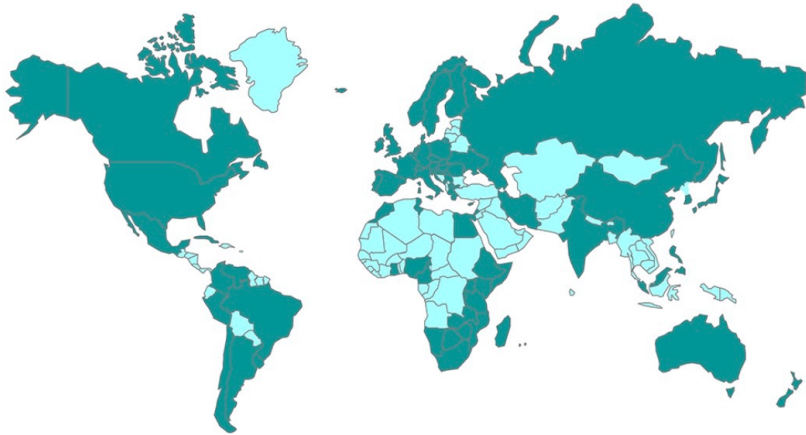


CURRENT AUSTRALIAN EMF - RF REGULATION

- Public Regulator = Australian Communications Media Authority (ACMA) In the USA it's the FCC.
- In Canada, the public regulator is the federal department of Innovation, Science and Economic Development (ISED) Canada. ISED has adopted Health Canada's radiofrequency limits from Safety Code 6 and largely adopted the ICNIRP guidelines.
- **ACMA Radiocommunications Act 1992. S162 (3) (f)**
"health and safety protection to persons who operate, work with or use wireless equipment via the establishment of standards"
- ACMA partially adopted ARPANSA RPS3 RF Standard – excluded the precautionary aspects. The latest revision of RP3 has dropped the precautionary principle.
- "Inclusion of the precautionary principle in the ACMA regulatory instruments would place a regulatory burden on industry, which would require strong justification. **The ACMA does not discern that justification**



IRPA is 53 Associate Societies in 68 Countries



[BENEFITS OF A RADIATION PROTECTION SOCIETY](#)

[HOW TO BECOME AN ASSOCIATE SOCIETY](#)

[WHEN DID EACH ASSOCIATE SOCIETY JOIN IRPA?](#)

[ASSOCIATE SOCIETY MODEL CONSTITUTION](#)

ARGENTINA

AUSTRALIA

AUSTRIA

BELGIUM

BOTSWANA

BRAZIL

BULGARIA

BURUNDI

CAMEROON

CANADA

CHILE

CHINA

COLOMBIA

CROATIA

CUBA

CYPRUS

CZECH REPUBLIC

DENMARK

EGYPT

ETHIOPIA

FINLAND

FRANCE

GERMANY

GHANA

GREECE

HUNGARY

ICELAND

INDIA

IRAN

IRELAND

ISRAEL

ITALY

JAPAN

KENYA

KOREA

LITHUANIA

MADAGASCAR

MALAYSIA

MEXICO

MONTENEGRO

MOROCCO

NAMIBIA

NETHERLANDS

NEW ZEALAND

NIGERIA

NORWAY

PERU

PHILIPPINES

POLAND

PORTUGAL

ROMANIA

RUSSIAN FEDERATION

RWANDA

SERBIA

SLOVAK REPUBLIC

SLOVENIA

SOMALIA

SOUTH AFRICA

SPAIN

SWEDEN

SWITZERLAND

TANZANIA

TUNISIA

UGANDA

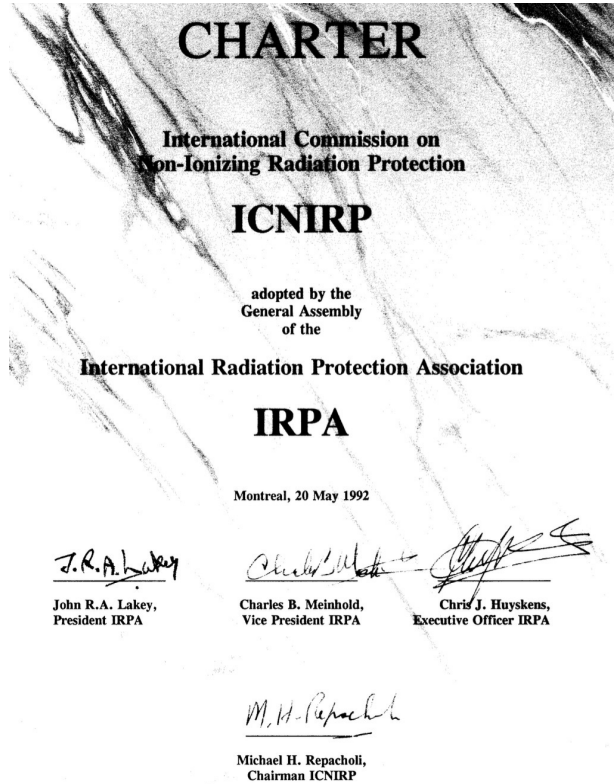
UNITED KINGDOM

URUGUAY

USA

VENEZUELA

Who formed ICNIRP?



Section	Requirements of ICNIRP Charter	Deficiencies Non-Compliance of ICNIRP with IRPA charter
Activities	ICNIRP give guidance for the protection of workers, members of the public, patients and the environment; "	Has not addressed the environment. Members of the public guidelines are not fit for purpose. Thermal only guidelines.
Activities	ICNIRP to establish relationships with ICRP	No relationship was established as radiation protection philosophies are different.
Activities	ICNIRP to establish relationships with United Nations organizations WHO, ILO, IAEA and UNEP and the Commission of the European Communities.	WHO only via EMF group. This group is an unbalanced group of thermal-only scientists. Very little input from the medical clinicians. Medical input is limited to UV radiation.
Relationship with IRPA	ICNIRP shall maintain a close liaison and working relation with the Executive Council of IRPA. and the IRPA Associate Societies, prior to publication. Unless otherwise agreed between the IRPA Executive Council and the Commission, the period for comment will be 90 days.	Failed to establish a relationship with IRPA. ICNIRP is a law unto itself

ICRP AND ICNIRP PHILOSOPHIES

■ ICRP = Risk managers (Insurance)

- Risk may exist (X rays, gamma rays)
- Low radiation doses → Risk

■ ICNIRP = Judge

- An NGO “Private Club” of thermal effects scientists.
- Aim: Create and promote world wide guidelines for wireless RF
- WHO via EMF project accept the ICNIRP standard.
 - **Requires certainty of serious harm before action.**
 - Low exposure levels → “No risk”
 - “People being protected”
However children, the elderly, and some chronically ill are not being considered



ICRP vs ICNIRP Philosophies

- **ICRP – Risk management approach**

- <100 mSv is a **Precautionary Approach** using ALARA

mSv is a milliSievert a measure of radiation dose. No such concept with EMR-RF we just have reference levels (exposure) only.

- **ICNIRP (2002) Non-Risk management approach**

- ICNIRP guidelines are based on poor quality behaviour of studies conducted in the 1980s involving 40–60-minute exposures in 5 monkeys and 8 rats, and then applying arbitrary safety factors to an apparent threshold specific absorption rate (SAR) of 4 W/kg.

- ***But notes“...children, the elderly, some chronically ill people ... lower tolerance for one or more forms of NIR exposure” Deleted statement in ICNIRP 2020***

- The precautionary Approach is not applied to these ‘at-risk’ groups.

Waiting for established evidence of harm is not a recognised risk management approach.₈

The Balance of evidence and RF guidelines

Requirements

1. Started to look at the evidence (Steven Weller (biochemist/biologist) had collated 150 recent studies and classified them with meta tags).
2. Set up a Database of EMF Bioeffects (ODEB).
3. I would not proceed with ORSAA if the evidence were 50/50
4. Set up ORSAA (Oceania Radiofrequency Scientific Advisory Association Inc. – aimed to attract a multidisciplinary set of scientists/researchers/engineers)
5. Using the ARPANSA literature database as a base, each paper was reviewed, and bioeffects were categorised.
6. I presented at ARPS conferences: 2015 Canberra, 2016 Adelaide, 2017 Wollongong, and 2018 Melbourne. I have been trying to raise awareness amongst my radiation protection colleagues. Dariusz Leszczynski was a keynote speaker at 2017 ARPS Conference.

ORSAA – AN INTRODUCTION

Oceania Radiofrequency Scientific Advisory Association Inc., (ORSAA) is a Not-for-Profit scientific association.

- Full members and advisory panel members are Non-industry scientists with a range of scientific disciplines:

Epidemiology, microbiology, biochemistry, physics, occupational hygiene, psychology, environmental science, endocrinology, immunology, neurology, oncology, building biology, pharmacology.

- Associate members are supporters who offer their expertise (teacher, accountants, nurses etc.) as volunteers
- We are an Advocacy Group.
- We are all volunteers.

TRIGGER POINTS FOR PRECAUTIONARY APPROACH

- Two main factors **triggers**:
 - Strength of evidence vs the potential **cost of doing nothing**
- Full **biological explanation** can take years:
 - **Asbestos** (1898 to 1999): 101 yrs
 - **Water** with cholera bacterium, Dr John Snow (1854 to 1883): 29 yrs.
 - **Smoking** Sir Richard Doll(1952 to 2000) smoking bans on aircraft):48 yrs.
 - **Brain cancer deaths amongst children are now on a par with Childhood leukaemia. Is this a trigger point?**

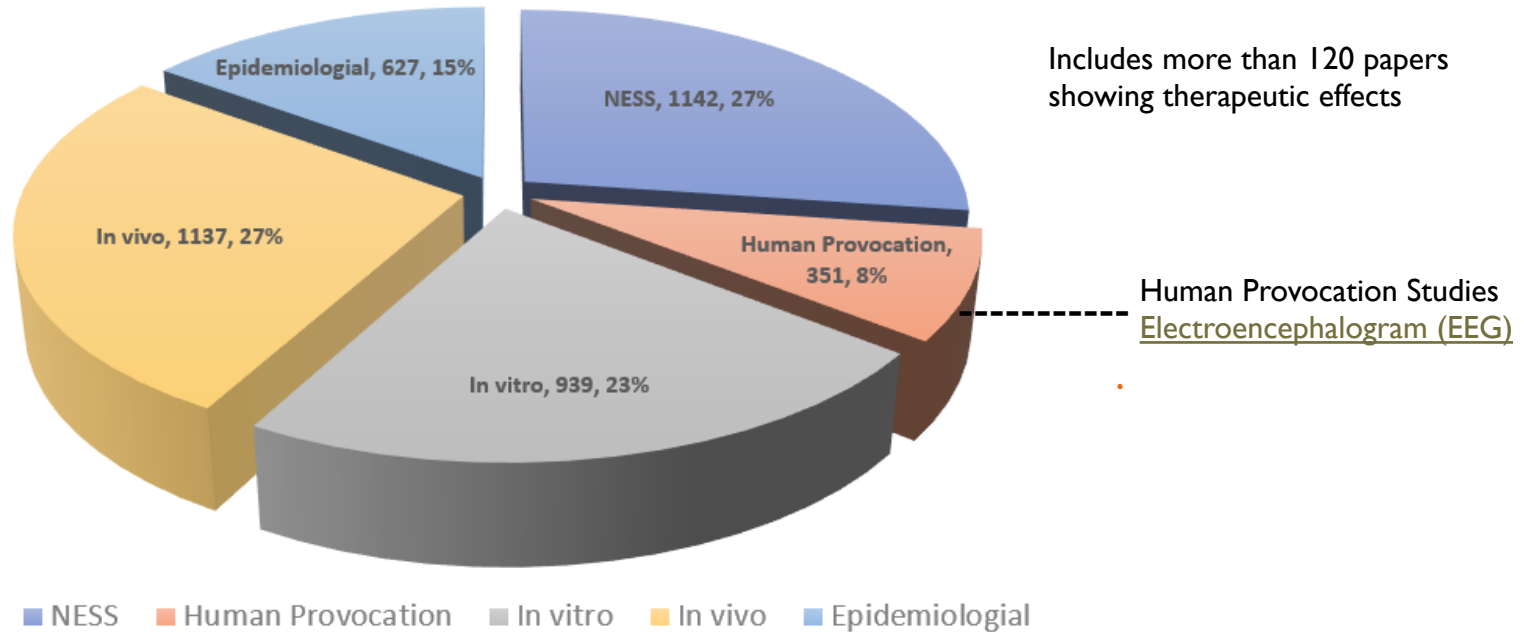
EVALUATING THE STRENGTH OF EVIDENCE

- **Many disciplines** are involved.
- **ORSAA database** – an analytical tool to evaluate the strength of evidence
 - https://a037613.fmphost.com/fmi/webd/Research_Review_V4
 - **Over 4,600 papers** objectively assessed and categorised
 - 3289 peer-reviewed experimental papers; the remainder are reviews, measurement/dosimetry studies

[ORSAA.org \(https://www.orsaa.org/\)](https://www.orsaa.org/)

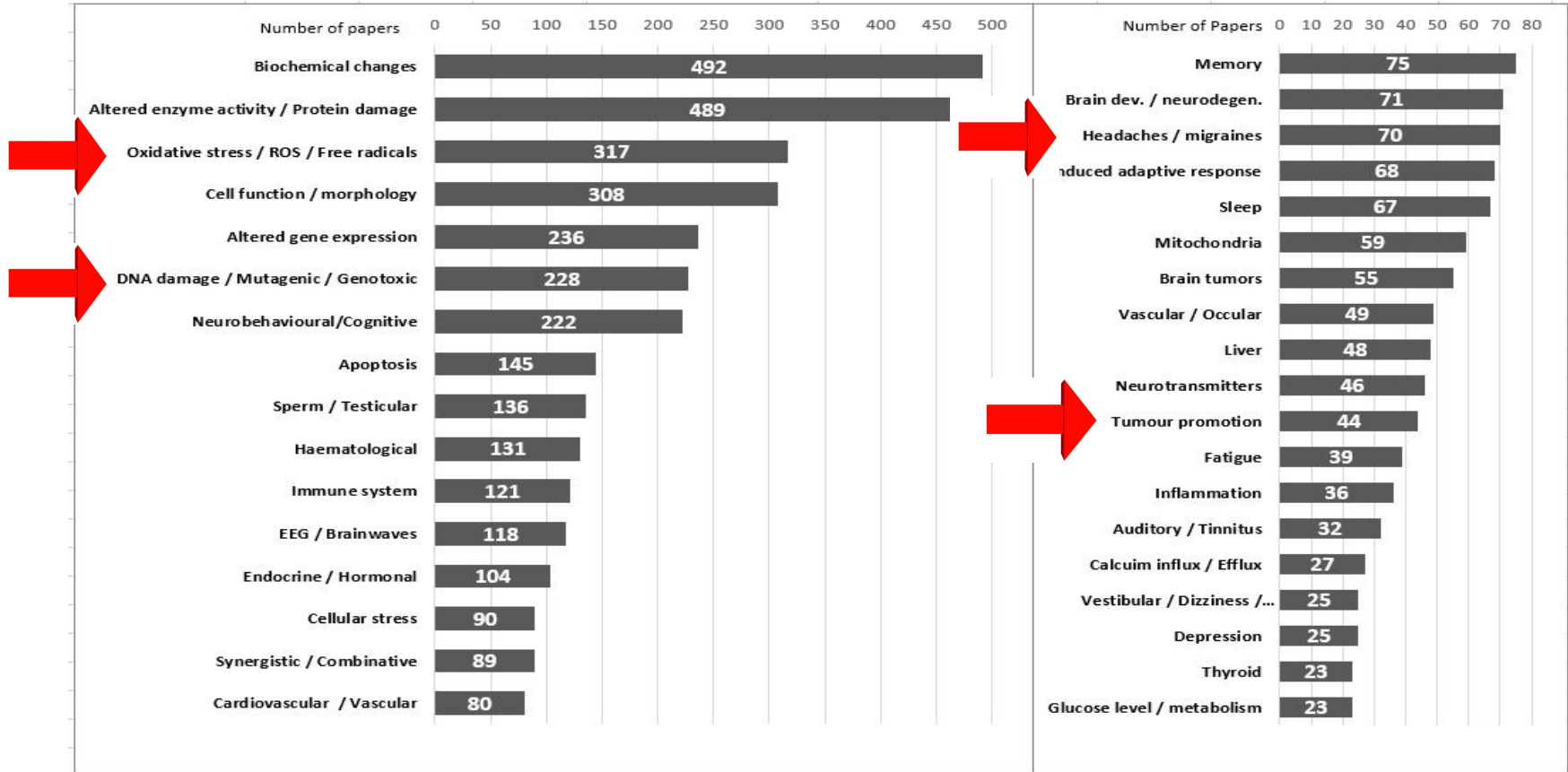
PUBLICATIONS USED: DATABASE ELF TO SHF (RADAR FREQ.)

Includes ARPANSA papers, Emeritus Prof Henry Lai papers, Prof Yuri Grigoriev & Prof Igor Belyaev > 6GHz frequencies papers
ORSAA Database on electromagnetic bioeffects (ODEB)



Unlike physics, replication studies are almost impossible to do as you need to reproduce molecular, genetic, cellular, and animal studies exactly.

The number of experimental papers showing non-thermal effects of radiofrequency within the prominent biological and health categories in ODEB.



FREE RADICALS – OXIDATIVE STRESS

- Of the 199 papers looking at DNA strand breaks, 62 papers also looked at free radical production

- Free radicals can:

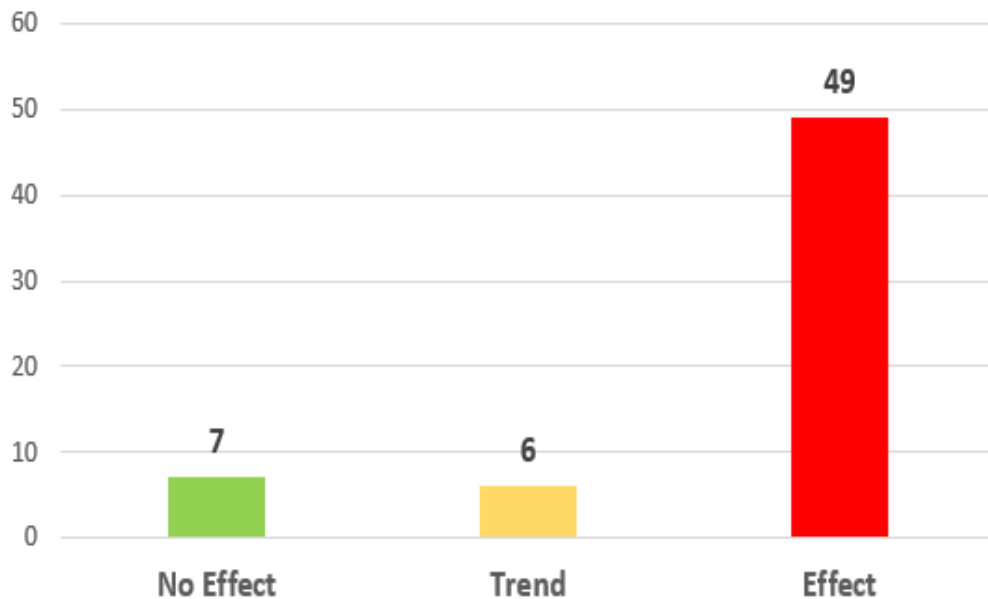
- Break chemical bonds
- Cause single strand breaks
- Cause double strand breaks
- Cause DNA Base damage

- 89% of papers (216 of 242)

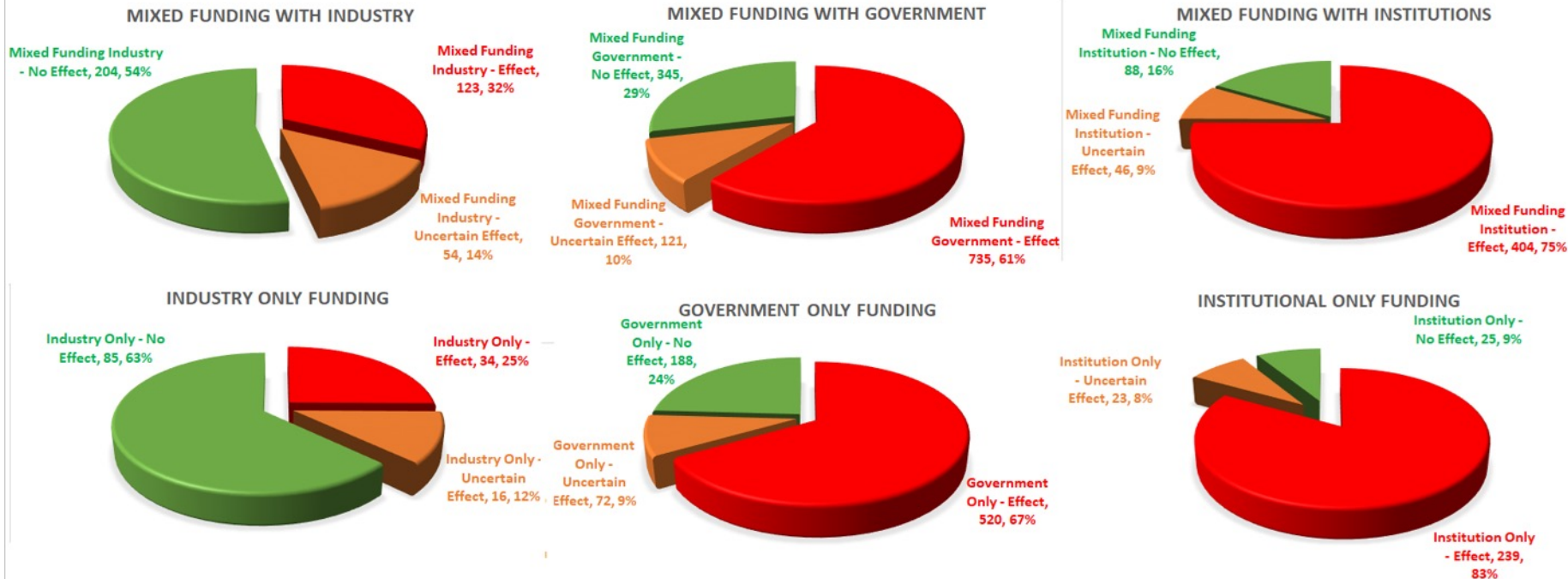
investigating RF and OS find

it (Bandara *et al.* 2018)

Oxidative Stress Findings



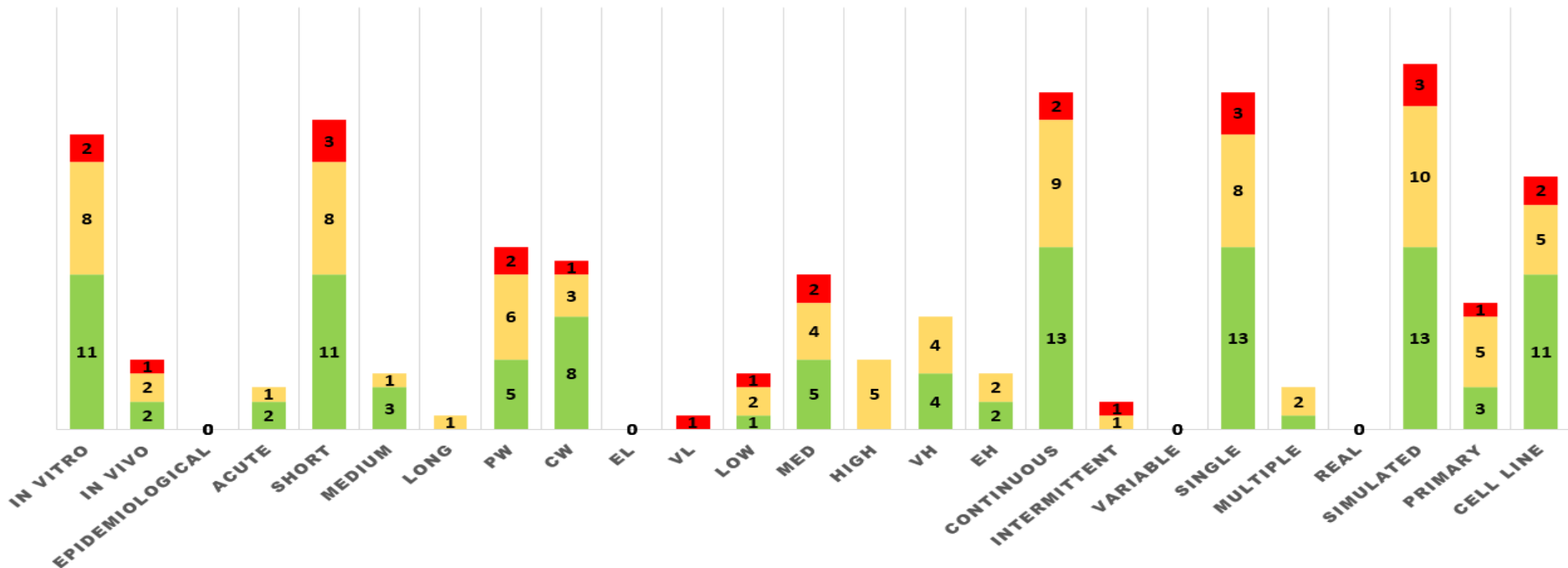
Funding Source and Outcomes



Source: ORSAA Database as of Nov 2019

EXPERIMENT ATTRIBUTES - INDUSTRY FUNDED WITH PARTNERS

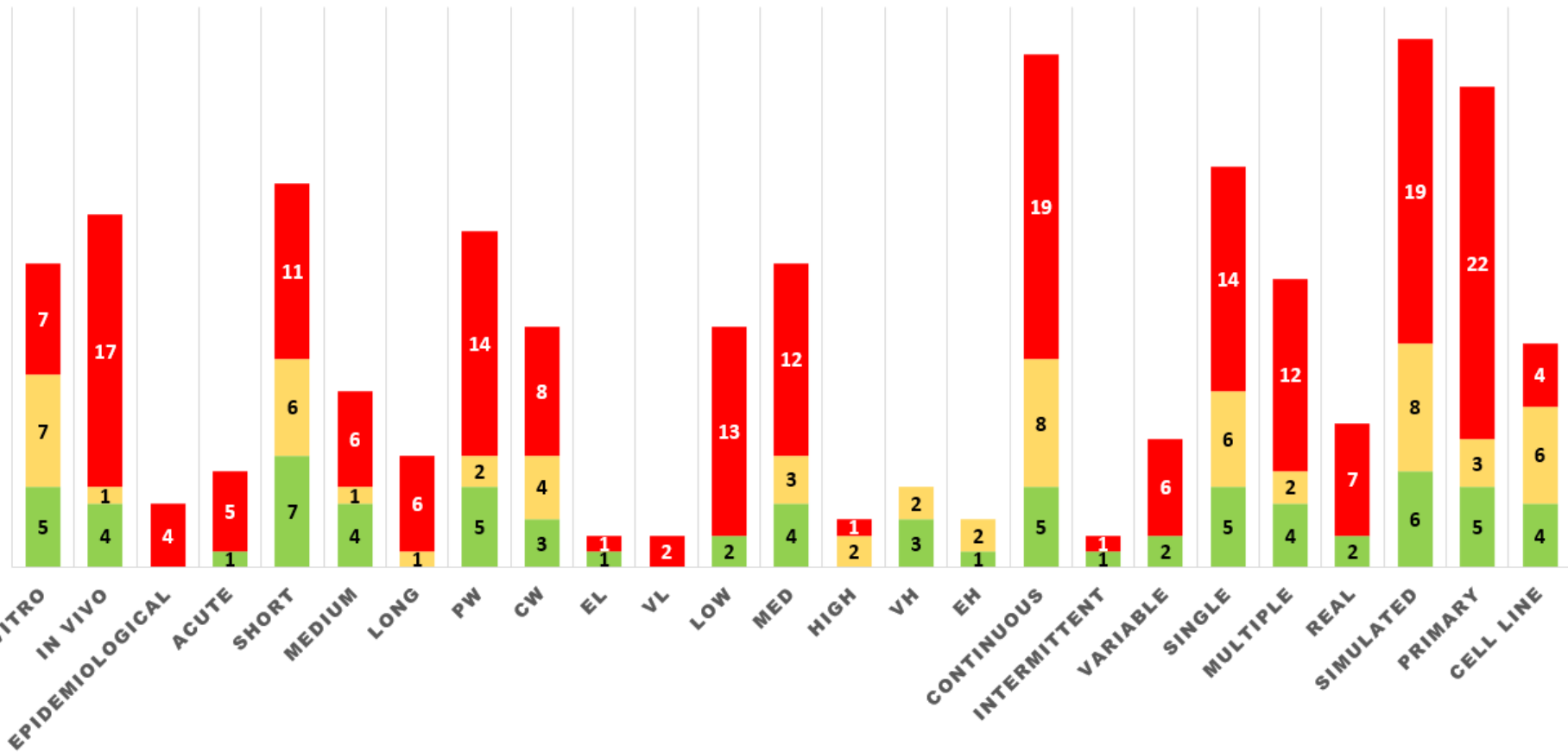
■ No Effect ■ Trend ■ Effect



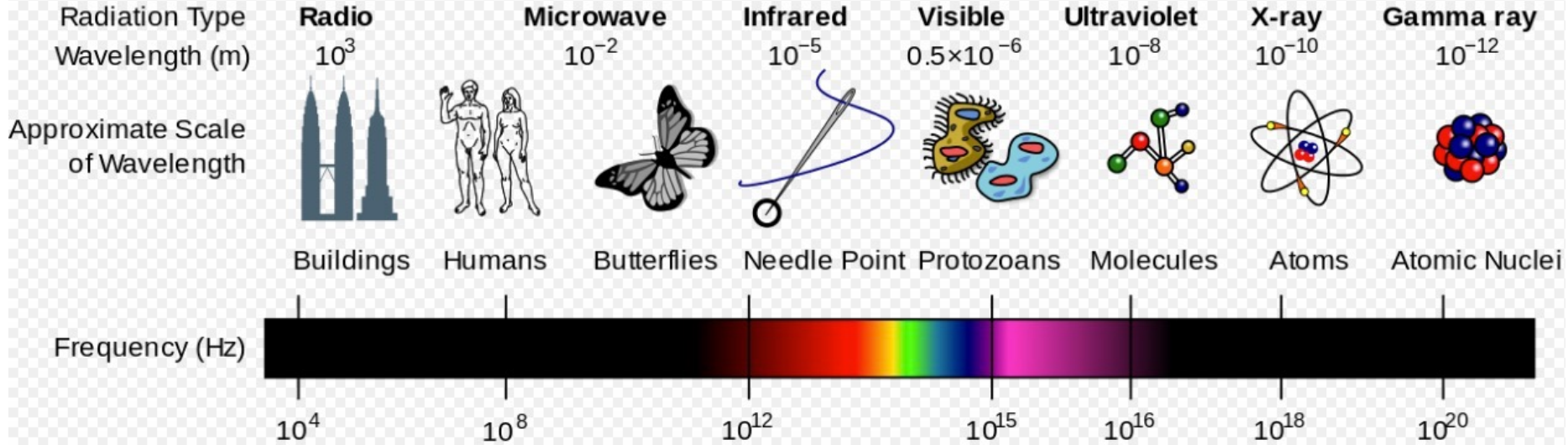
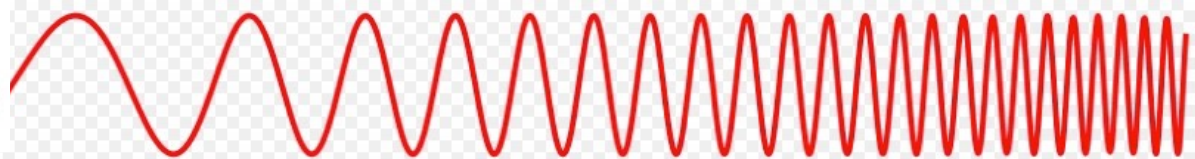
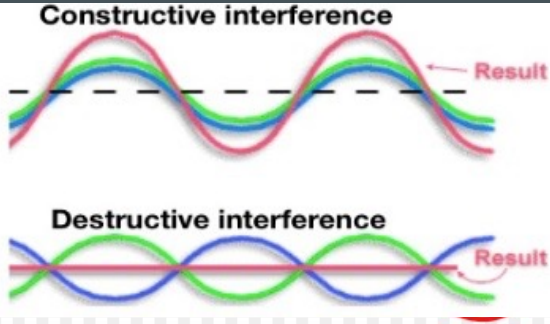
Industry and partner-funded research tend **not** to conduct long-term studies, epidemiological studies, and multiple exposures, instead, there is a preference for using simulated signals rather than real-world signals.

EXPERIMENT ATTRIBUTES - INSTITUTIONALLY FUNDED WITH PARTNERS

■ No Effect ■ Trend ■ Effect



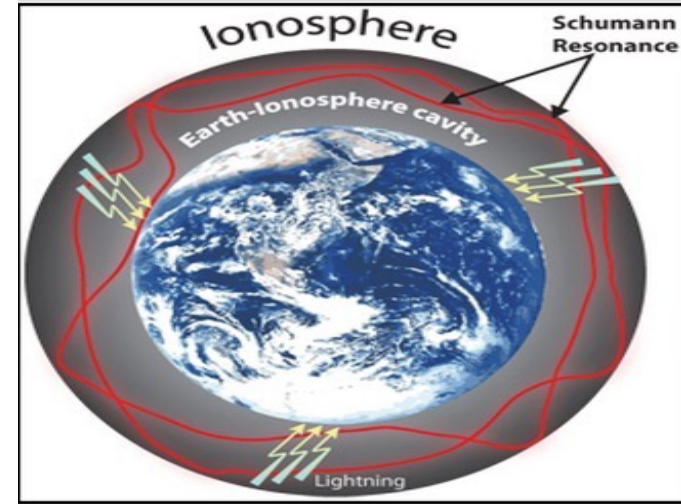
ELECTROMAGNETIC SPECTRUM



Sunny clear sky day 2000 W/m^2 , which is 200 to 5,000 higher than the RF frequencies used for Mobile phones and Wi-Fi, but there is a big difference.

LIFE ON EARTH EVOLVED WITH EXTREMELY LOW FREQUENCY ELF

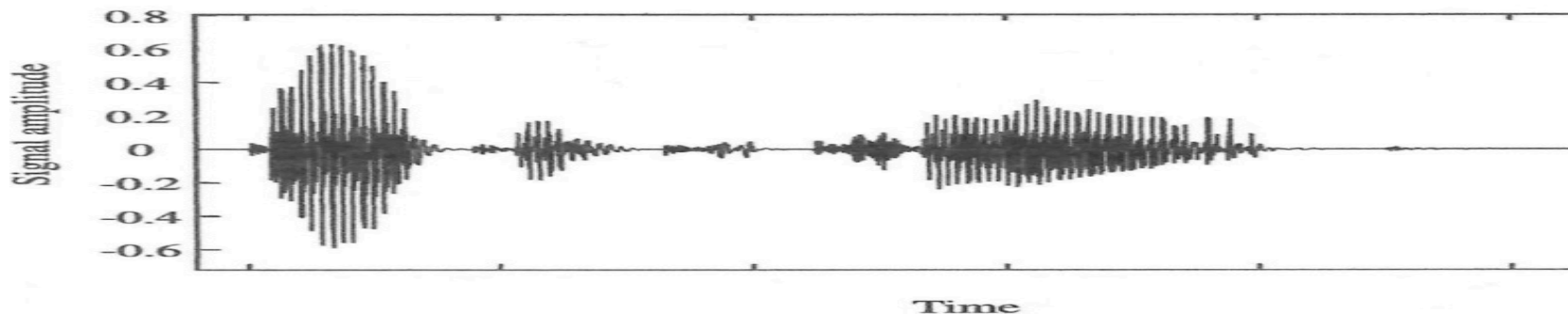
The Schumann Resonance (SR) is defined as a set of resonant modes or spectrum peaks, between 7.83 and 45 Hz, in the extremely low frequency (ELF) portion of the Earth's EMF spectrum. Human brainwaves are ELF and close to these natural frequencies. These ELF are necessary for biological processes, homeostasis and adaptation. We cannot thrive without them.



≈ 2000 thunder storms happening on the planet at any moment.
≈ 100 lightening strikes per sec

SIMULATED vs REAL MOBILE PHONES SIGNAL

From Dr Dimitrios J. Panagopoulos <https://www.youtube.com/watch?v=adGtb0kxsDM>



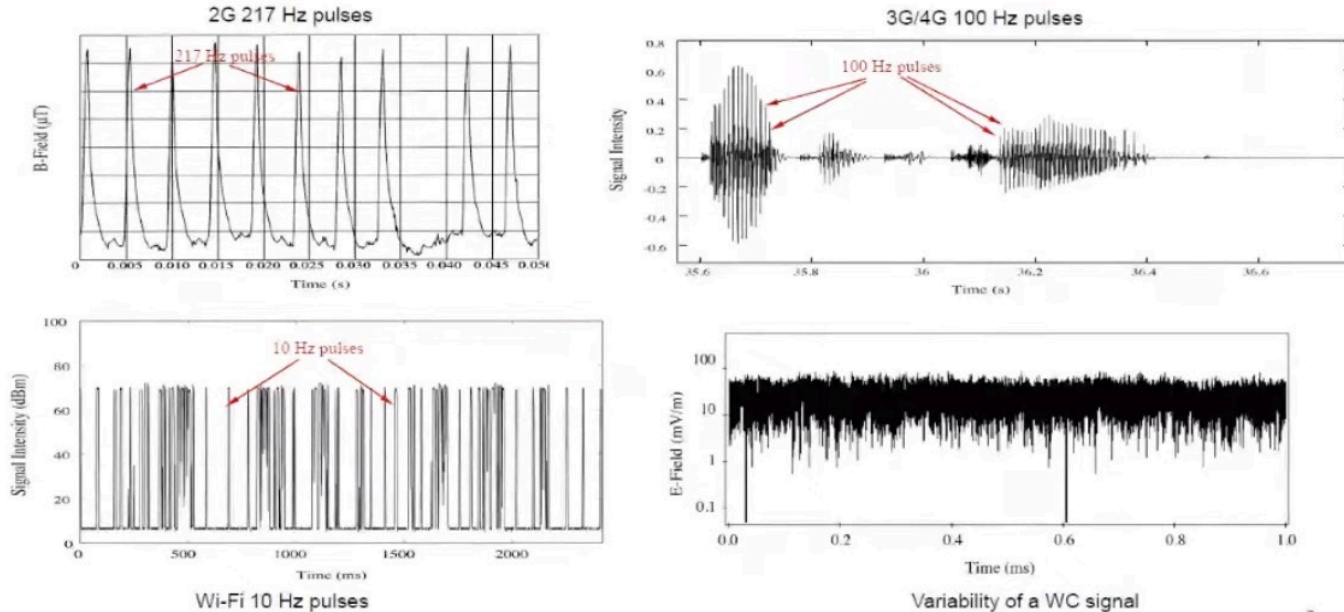
Research Categories	Real Mobile Phone used in Experiments			Simulated Mobile Phone Signals used in Experiments		
Wave form	Pulsed			Pulsed		
Outcome	#Effect	#No Effect	#Uncertain Effect	#Effect	#No Effect	#Uncertain Effect
<i>in vivo</i>	120	18	11	69	49	8
<i>in vitro</i>	28	8	1	60	63	7

A novel database of bio-effects from non-ionizing radiation by Leach VA, Weller S, Redmayne M.
<https://www.ncbi.nlm.nih.gov/pubmed/29874195>

LOW-FREQUENCY PULSATIONS & MODULATED WAVES

Dimitrios J. Panagopoulos slides EU EHS workshop <https://www.youtube.com/watch?v=s1Kn7pGy3Cl>

ELF/ULF Pulsation and Variability of WC signals

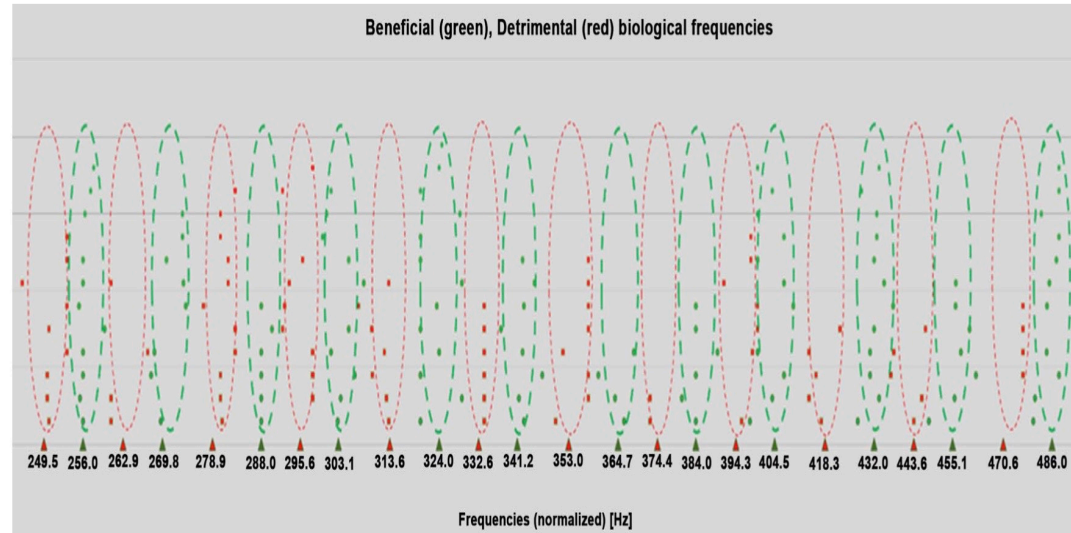
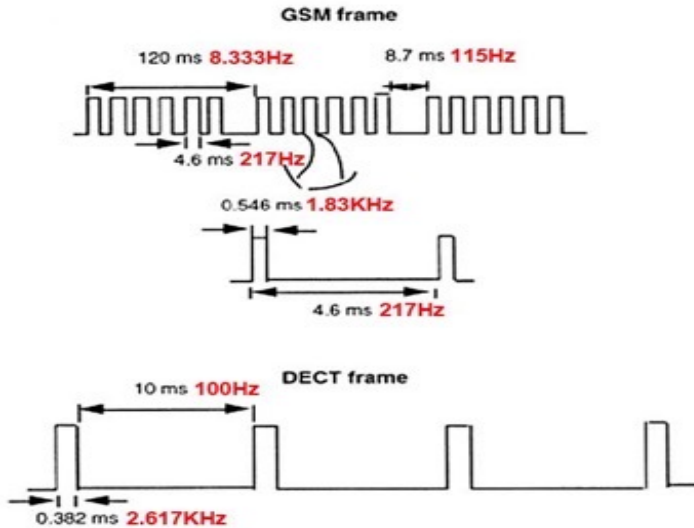


MAN-MADE RF - TROJAN HORSE

EEG provocations studies from the ORSAA database shown in show clearly (87%) of all studies show effect. These pulsed-modulated signals contain low frequency components due to battery switching and repetition frame rates (2 Hz^{GSM}, 8.33 Hz^{GSM}, 100 Hz^{DECT}, 115 Hz^{GSM}, 217 Hz^{GSM}.) Such components trigger physiological responses in the brain.



Hans Geesink & Dirk Meijer, Groningen Uni Netherlands

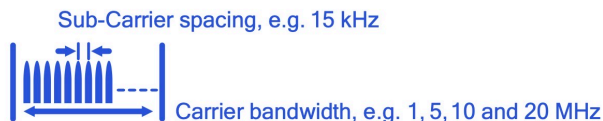


5G Orthogonal frequency-division multiplexing (OFDM) has lower frequency sub-carriers

Scalable 5G NR OFDM numerology—examples

Outdoor macro coverage

e.g., FDD 700 MHz



Outdoor macro and small cell

e.g., TDD 3-5 GHz



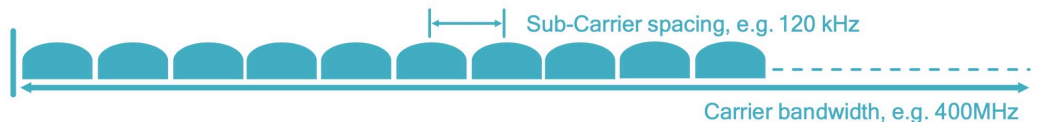
Indoor wideband

e.g., unlicensed 6 GHz



mmWave

e.g., TDD 28 GHz



2^n scaling of Sub-Carrier Spacing (SCS)

A diagonal color gradient bar on the right side of the slide, transitioning from blue at the top to teal at the bottom, representing the 2^n scaling of sub-carrier spacing (SCS) across the different numerology examples.

SUMMARY FINDINGS

- DNA damage is associated with field intensity and exposure duration
 - Non-linear intensity response (Lower intensities vs Higher intensities)
 - Non-thermal effects are obvious
 - A higher number of papers report damage at lower intensities
 - Non-thermal action via oxidation/free radical damage, conformation changes (DNA/Proteins) and possibly repair Inhibition?
 - Dose-response tendency noted – the longer the exposure higher the chance of DNA damage.
 - Some studies show heterogenous populations exist with varying sensitivity to EM fields (pooling of data will hide those who are sensitive)
 - DNA damage caused by RF is comparatively lower than other known genotoxic agents (ionising radiation, chemicals etc.)

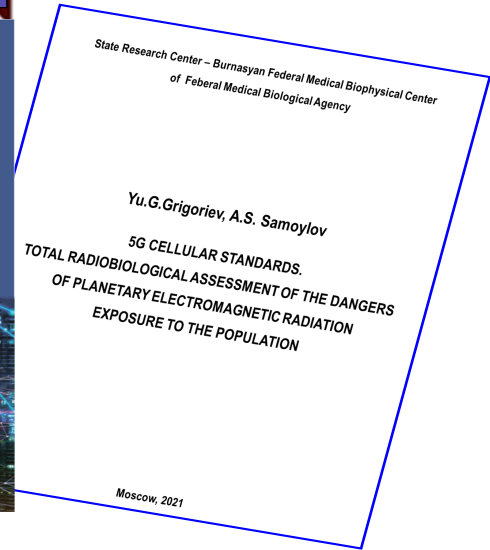
Exposure to RF is occurring 24x7, unlike other agents which are typically sporadic.

CONTROVERSIAL FINDINGS AND ISSUES

- Results show a real risk for genotoxicity, particularly long exposures
- Case for carcinogenicity is made stronger
- All species are at risk as we blanket the earth with RF
- ARPANSA and ICNIRP do not consider these risks because they
 - Require consistency in results
 - and confirmed evidence of harm (proof)
- No pre-market health testing when rolling out new wireless technology
- Safety is assumed if operating within public limits
- Precaution is absent, ARPANSA explicitly removed precautionary principle from latest RF Standard (RPS S-1), was present in RPS 3 (previous version)
- Sensitive populations are not considered

5G WIRELESS: A RADIOBIOLOGICAL ASSESSMENT

Translation of a Book by: Prof Yuri Grigoriev (1925-2021)

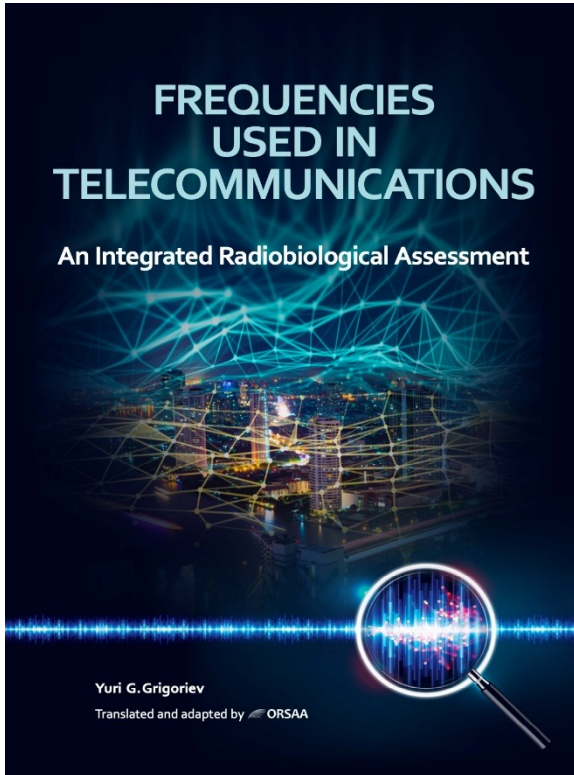


5G Cellular Standards. Total radiobiological assessment of the dangers of planetary electromagnetic radiation exposure to the population.

ORSAA WAS GIVEN THE TASK BY YURI TO TRANSLATE HIS BOOK

New title : Frequencies used in telecommunications an integrated radiobiological assessment.

With Yuri's permission we added in some recent finding from the research.



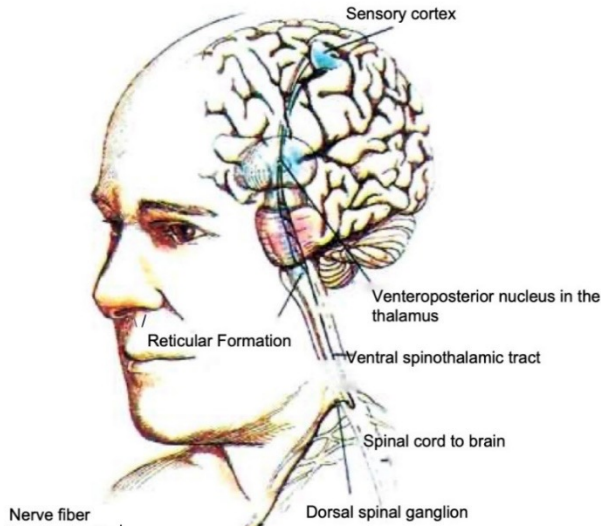
For millimetre waves $> 30 - 300$ GHz what research from the last last half century do we have regarding the skin and eyes?

1. The sclera of the eyes: Almost no research.
2. The skin: Limited research.

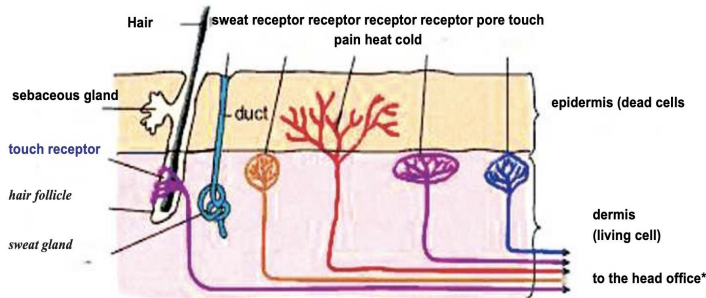
ICNIRP approach:

- ICNIRP guidelines treat skin as an inert substrate with no biological function , just an overcoat;
- The only criteria for setting limits is for heating and pain;
- Ignores biological role of skin.;
- Limited research - Leszczynski D. (2020).

SKIN (mmWAVES)

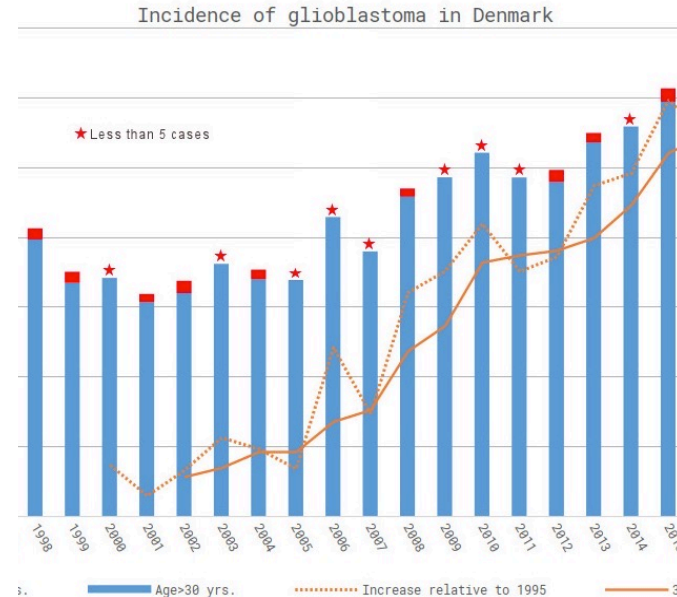
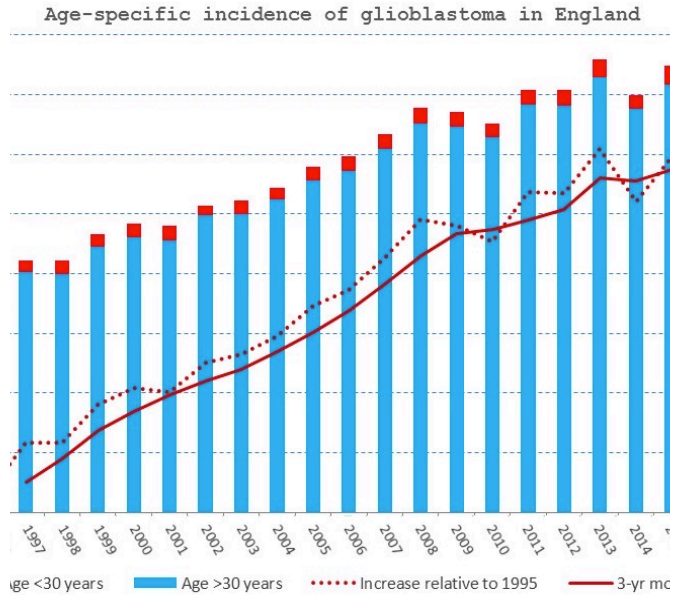


Receptors in the human skin



- Largest organ.
- Interfaces with immune system.
- Rich in nerves and very sensitive.
- Connects to the brain and central nervous system and blood vessels which are interconnected with other organs
- Receptors carry abundant innervation for central and autonomic nervous system.
- Regulates of immunity and wound healing.
- Surface is a natural environment for thousands of different microbial species.
- Part of waste removal system; discharges toxins from body.
- Protects against mechanical and chemical factors, ultraviolet radiation, and the penetration of microbes and viruses.
- Performs endocrine functions; Produces vitamin D

BRAIN CANCER ON THE INCREASE IN OVER 60'S



ARPANSA Ecological Study left out over 59's Did see an increase in 1982-1992 but put it down to better detection techniques. However ,no support for this conclusion was given. In fact other researchers were not so sure.

Desmeules M et.al [J Natl Cancer Inst 84:442-445,1992]

Conclusions: Among elderly North Americans, at least two fold increases in brain cancer incidence were observed over the last two decades. Since our findings show that CT scans and MRI are responsible for the detection of about 20% of brain tumors, we conclude that other factors also are responsible for the observed trends.

IN SUMMARY

- Research shows us for certain brain tumours:
 - the higher the cumulative hours of Mobile phone (MP) use, the higher the risk;
 - the longer the time from when first using a MP, the higher the risk;
 - the higher the power, the higher the risk;
 - the younger you are, the higher the risk;
 - the tumour occurring on the same side of brain as the handedness (ipsilateral) of the user, the higher the risk'
- 'If a mobile phone is used for more than 10 years there is a statistically significant risk. Hence, we need to get people to change their habits when using these radiation devices and adopt a precautionary approach.
- 'Bottom line : using mobile phones increases your risk of brain tumour'

PLANTS ARE AFFECTED

- ORSAA Database has 41 plant papers 31 “Effect” studies, 2 “Uncertain Effect” Studies, 0 (Zero) “No Effect” studies and 8 reviews. Observations below 2007, 2009,2013
- Increases production of Terpenes in plants makes plants more flammable.
- Plant growth rate change is shown in 6 studies



Effect of radar on city landscaping plant in Valladolid, Spá
(24 GHz speed detector). Photo by Alfonso Balmori.



BIRDS & INSECTS (ANTS, BEES) ARE EFFECTED

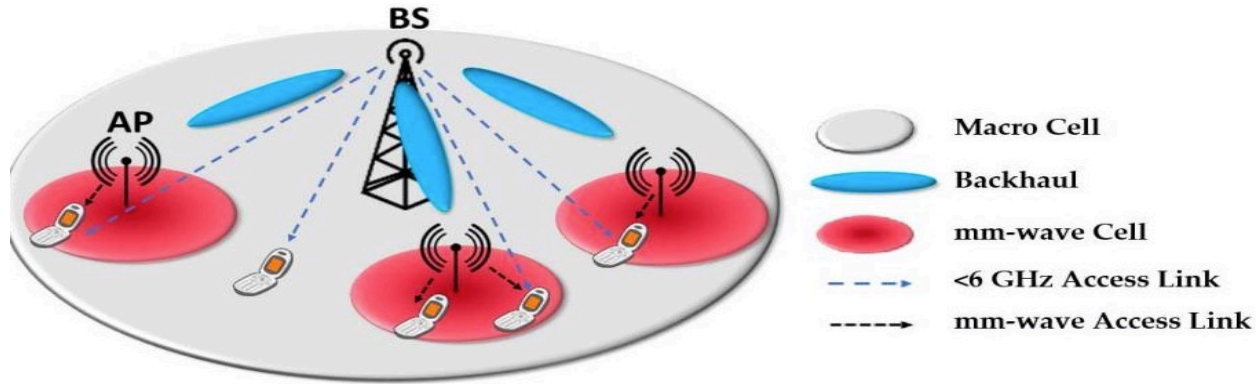
- ORSAA Database has 3 bird studies all “Effect” studies.
- Birds, Avian Magnetoreception / Electroreception Effects.
- ORSAA Database has 31 insect studies in total. 15 Fruit flies studies, 3 Bees Studies, 4 Cockroach studies, 3 Ant studies, 1 Termite study, 1 stick insect study, 1 locus study and 3 review studies.
- Insects – Navigational Effects (3), Reproductive Effects (11), Insect Magnetoreception / Electroreception Effects (10), Insect Colony Collapse (1)
- “Comparing DNA damage induced by mobile telephony and other types of man-made electromagnetic fields” Dr Dimitris Panagopoulos <https://www.sciencedirect.com/science/article/pii/S1383574218300991>

Conclusions of fruit fly studies from Dr Dimitris Panagopoulos (PhD, Biology, Physics)

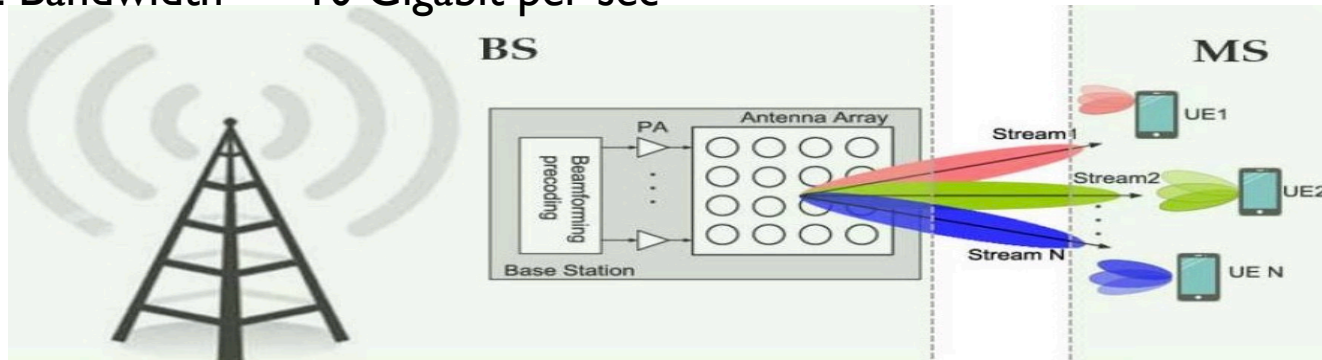
“The present study further confirms my previous results and conclusions that experiments should employ real-life and not simulated EMFs, and human/animal exposure to microwave telecommunication EMFs should be drastically reduced by prudent use, and establishment of much stringer exposure limits by the responsible health authorities “

Current “G” and Future “G” **Where Are We Heading?**

5G Stage I – Bandwidth approaching 1 Gigabit per sec



5G Stage 2 Bandwidth > 10 Gigabit per sec



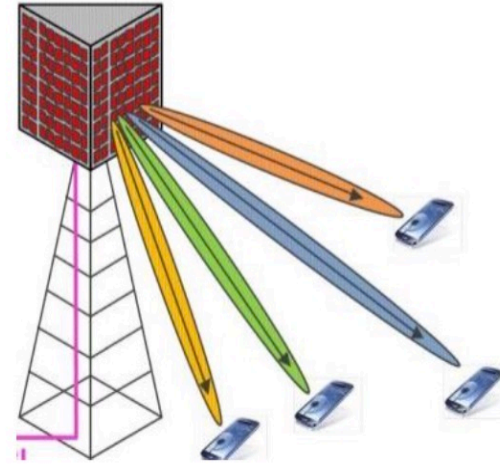
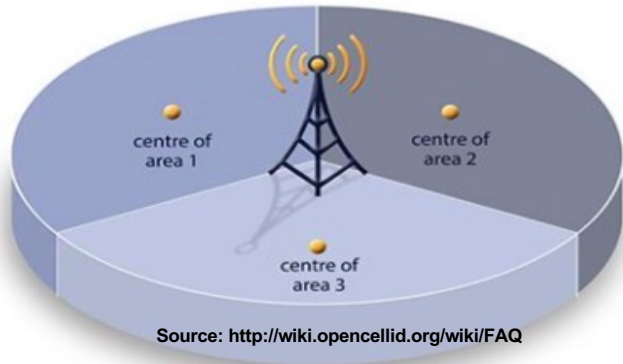
Review of Recent Phased Arrays for Millimeter-Wave Wireless Communication.
<https://www.ncbi.nlm.nih.gov/pubmed/30248923>

5G STAGE 2

MASSIVE MULTIPLE INPUT MULTIPLE OUTPUT (MIMO) BEAM STEERING TECHNOLOGY

5G will use beam sweeping technology to find users

cell tower with 3 cells, each with 120° angle



Belgian Institute for Postal services and Telecommunications. Study of 12 September 2018 on the impact of the radiation standards in Brussels on the deployment of mobile networks

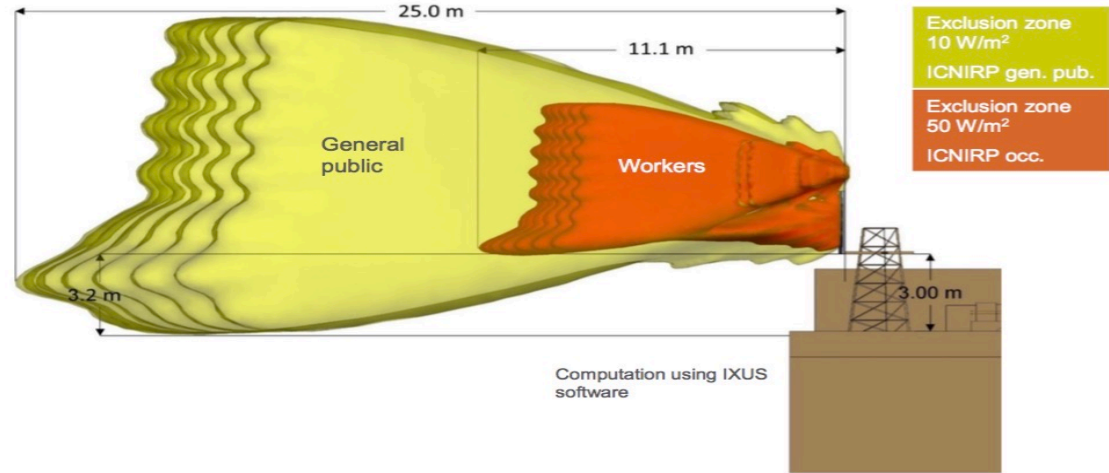
<https://www.bipt.be/en/operators/radio/antennas-site-sharing/study-of-12-september-2018-on-the-impact-of-the-radiation-standards-in-brussels-on-the-deployment-of-mobile-networks>

28 GHZ WON'T PENETRATE BUILDINGS NEED TARGETED BEAMS.
FASTER DATA TRANSFER RATES 10 TO 20 GIGABITS PER SECOND
REQUIRES MORE POWER.

3.5 GHz 5G site with massive MIMO



- 3.5 GHz, 200 W
- Massive MIMO (64 elements)
- EIRP of 72 dBm
- Installation on existing site with 2G, 3G and 4G antennas
- Theoretical maximum power (100% simultaneous utilization) assumed for all antennas



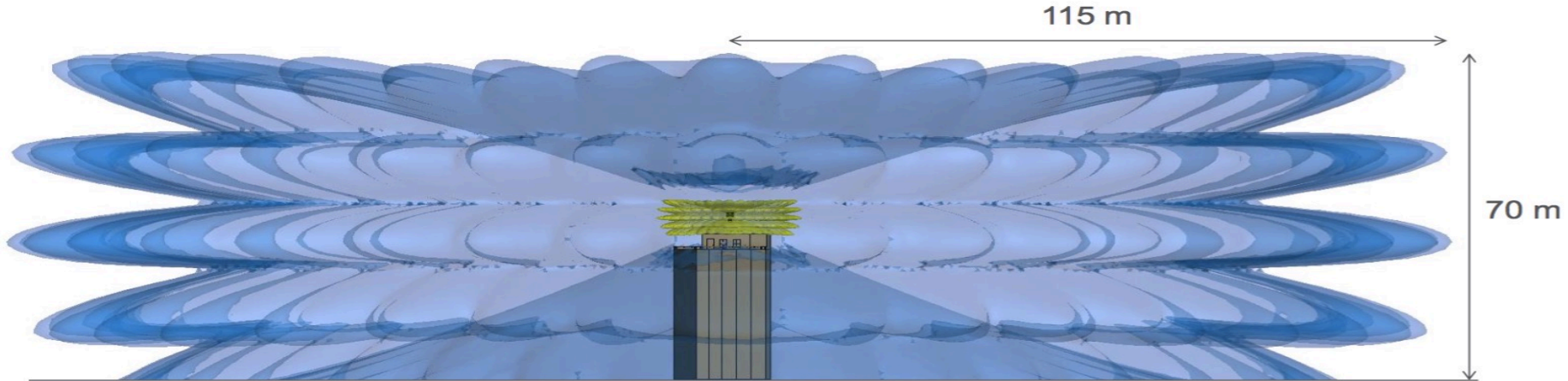
Very large exclusion zone due to unrealistic power - may lead to substantial 5G deployment challenges
IEC 62232 (2017) and ITU-T K.100 standards open up for use of actual maximum output power (95th percentile)

COUNTRIES AND CITIES WITH A LOWER STANDARD WILL BE IMPACTED

China, India, Poland, Russia, Italy and Switzerland, regions of Belgium or cities such as Paris and Rome. ICNIRP 2020 relax the guidelines is the answer.

Impact of lower national EMF limits

1/100 of ICNIRP limit



Size of exclusion zone makes 5G network roll-out a major problem or impossible

Exclusion zone
10 W/m²
ICNIRP limit

Exclusion zone
0.1 W/m²
1/100 of ICNIRP limit

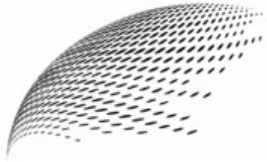
5G TALKING POINTS

- Myth: 5G is safe
- Fact: There have been no formal health based studies conducted looking at 5G effects on Humans or the greater environment
- Myth: 5G is safer than previous “G” technologies
- Fact: 5G may use mm Wave (28Ghz) technology that will only be absorbed by the skin but will also use microwave wavelengths (3.5Ghz) which will penetrate the skull making all organs vulnerable as per current 3G and 4G technology
- Myth: 5G will not increase background EMR levels
- Fact: 5G will operate in conjunction with current 3G and 4G infrastructure and will add to the existing EMR pollution. 5G will use military technology (Phased array and beam steering). Beam steering uses a collimated beams so does not follow inverse square law (in the near field)

ORSAA CONCLUSIONS

- Converging evidence on health effects.
- Non-thermal bio-effects are **real**.
- Why no 5G bio-effects research? University research is now supply and demand-driven.
- Research is also Market-driven. Public Health is ignored for profits.
- Devices need a higher safety design standard. ALARA needs to be part of the design
- Stronger consumer advice on safe use
 - better than “If you are concerned !”
 - especially **children**
 - Advice on **safer use is hidden**
 - Needs to be very **obvious**
- Research data, together with best risk management practices, confirms::

ORSAA believes a trigger point has been reached for adopting a proper Precautionary Approach to this new RF-EMR technology



Oceania Radiofrequency Scientific Advisory Association

Providing an independent scientific view point

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EXTRA SLIDES NOT USED

What happens when you use a Mobile Phone thinking there is no risk associated with their use?

Over use of this technology may result in a brain tumour– 6 hours per day some days, 2 hr conference calls. He has spent his whole working life on mobiles. Aged 43



SAR STANDARD EXCEED BY MOBILE PHONE PLACED NEXT TO BODY

- The 2-millimeter distance was chosen to estimate the potential exposure for an owner carrying the phone in a pants or shirt pocket. Under those conditions, most of the models tested yielded results that were over the exposure limit, sometimes far exceeding it.

<https://www.chicagotribune.com/investigations/ct-cell-phone-radiation-testing-20190821>

- USA and FRENCH study show the same results. Air gap is required to stay below standards

SOME MANUFACTURES HAVE MOVED MOBILE PHONE ANTENNA

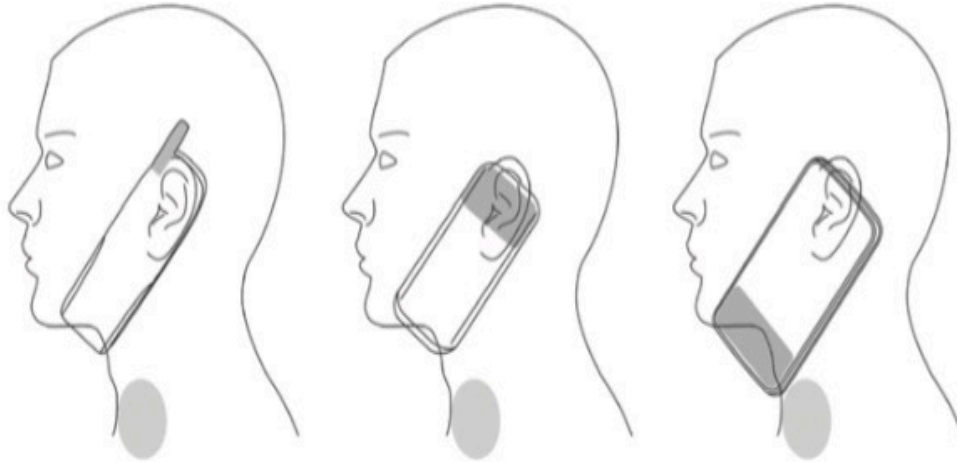


Figure 9. Mobile phone antenna placements in regard to the thyroid gland (grey). Different localizations of the antenna depending on new generations of mobile phones are shown in the panels from left to right.