Mobile phones, wireless communication and health – what you are not told by authorities and media

Tallinn June 2018

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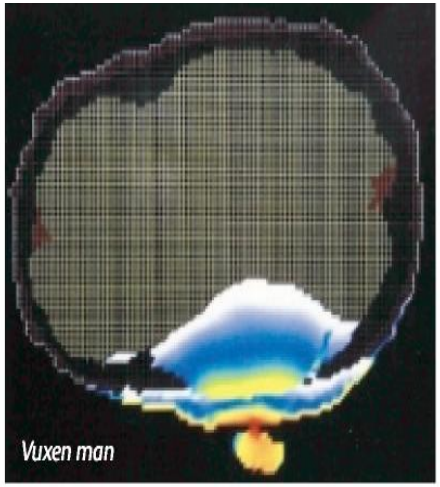
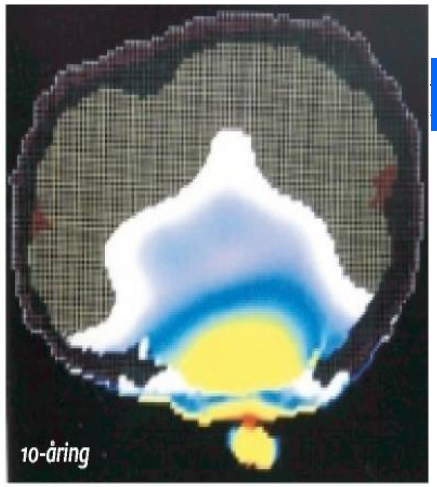
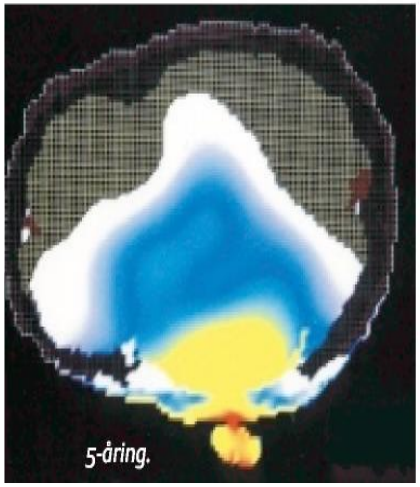
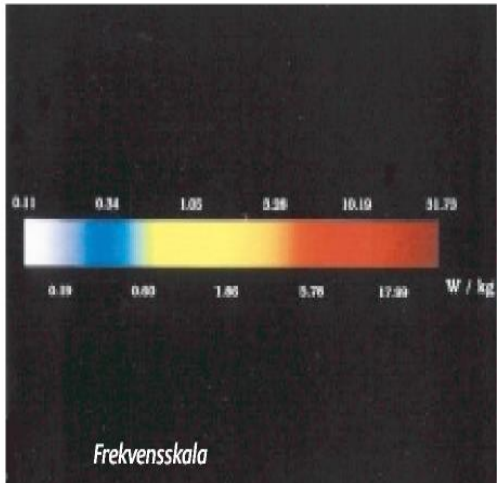
ÖREBRO LÄNS LANDSTING
ÖREBRO UNIVERSITY





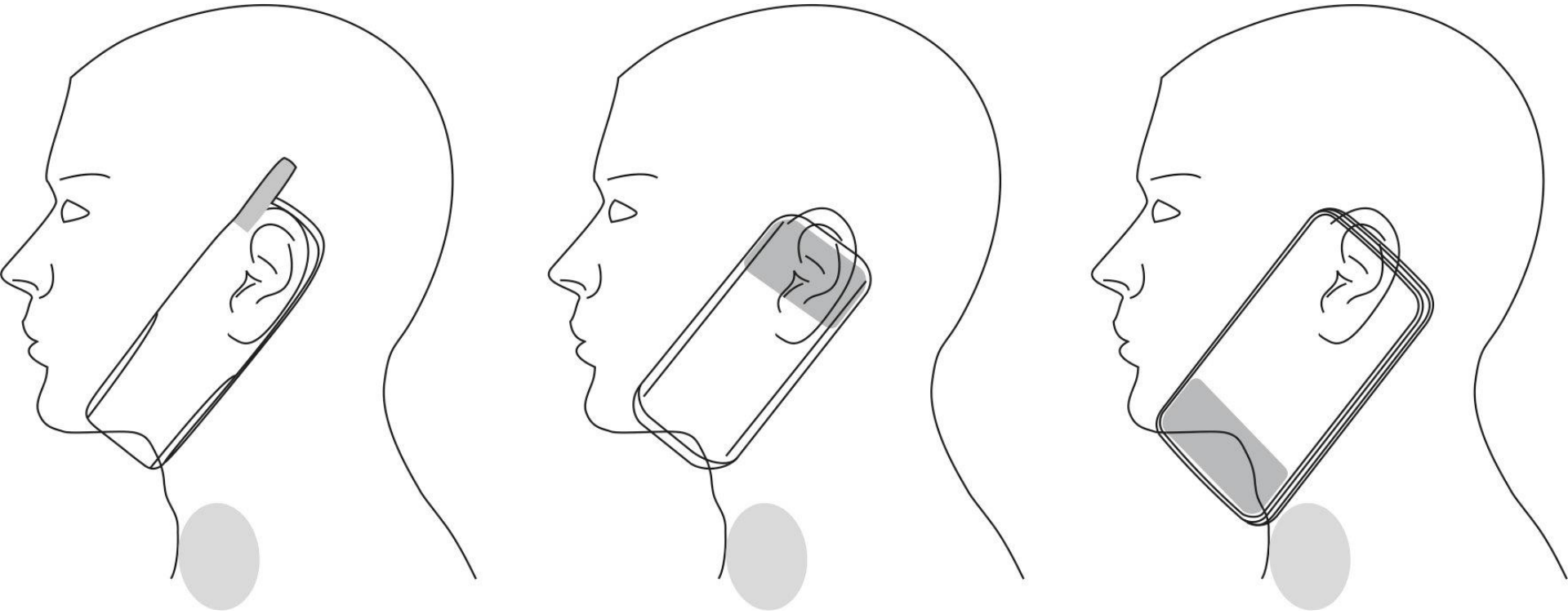




Adult man, 10 years child, 5 years child, frequency scale.

GSM phone 835 MHz with SAR in Watt/kg.

Professor Om Gandhi with courtesy.



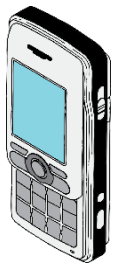
World Health Organization

IARC/WHO risk evaluation, 2011:

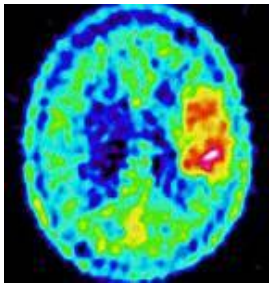
The WHO/International Agency for Research on Cancer (IARC) has classified radiofrequency (RF) electromagnetic fields as **possibly carcinogenic to humans (Group 2B)**, based on an increased risk for **glioma**, a malignant type of brain cancer, and **acoustic neuroma** associated with **wireless radiation**

http://www.iarc.fr/en/media-centre/pr/2011/pdfs/pr208_E.pdf

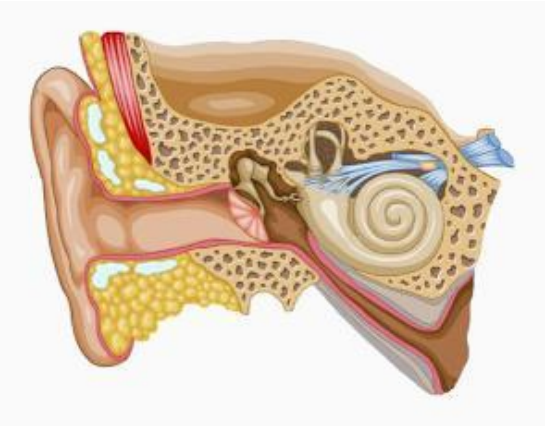
(All sources for radiation in the frequency range 30 kHz–300 GHz)



GLIOMA	Ipsilateral		
	Cases/controls Numbers of exposed	Odds Ratio	95 % Confidence Interval
Interphone 2010			
Cumulative use ≥1,640 h	100/62	1.96	1.22 – 3.16
Coureau et al 2014			
Cumulative use ≥896 h	9/7	2.11	0.73 – 6.08
Hardell, Carlberg 2015			
Cumulative use ≥1,640 h	138/133	3.11	2.18 – 4.44
Meta-analysis			
Cumulative use ≥1,640 h*	247/202	2.54	1.83 – 3.52



Acoustic neuroma	Ipsilateral		
	Cases/controls Numbers of exposed	Odds Ratio	95 % Confidence Interval
Interphone 2010			
Cumulative use ≥1,640 h	47/46	2.33	1.23 – 4.40
Hardell et al 2013			
Cumulative use ≥1,640 h	19/133	3.18	1.65 – 6.12
Meta-analysis			
Cumulative use ≥1,640 h	66/179	2.71	1.72 – 4.28



Pathology findings – Brain

Hyperplastic Brain Lesions in Male Rats

	Control	GSM Modulation			CDMA Modulation		
	0 W/kg	1.5 W/kg	3.0 W/kg	6.0 W/kg	1.5 W/kg	3.0 W/kg	6.0 W/kg
Number examined	90	90	90	90	90	90	90
Malignant glioma‡	0*	3 (3.3%)	3 (3.3%)	2 (2.2%)	0	0	3 (3.3%)
Glial cell hyperplasia	0	2 (2.2%)	3 (3.3%)	1 (1.1%)	2 (2.2%)	0	2 (2.2%)

‡ Historical control incidence in NTP studies: 11/550 (2.0%), range 0-8%

* Significant SAR-dependent trend for CDMA exposures by poly-6 ($p < 0.05$)

Pathology findings – Schwannomas

Schwannomas Observed in Male Rats

	Control	GSM Modulation			CDMA Modulation		
	0 W/kg	1.5 W/kg	3.0 W/kg	6.0 W/kg	1.5 W/kg	3.0 W/kg	6.0 W/kg
Number examined	90	90	90	90	90	90	90
Heart‡	0*	2 (2.2%)	1 (1.1%)	5 (5.5%)	2 (2.2%)	3 (3.3%)	6** (6.6%)
Other sites	3 (3.3%)	1 (1.1%)	4 (4.4%)	2 (2.2%)	2 (2.2%)	1 (1.1%)	2 (2.2%)
All sites (total)	3 (3.3%)	3 (3.3%)	5 (5.5%)	7 (7.7%)	4 (4.4%)	4 (4.4%)	7 (7.7%)

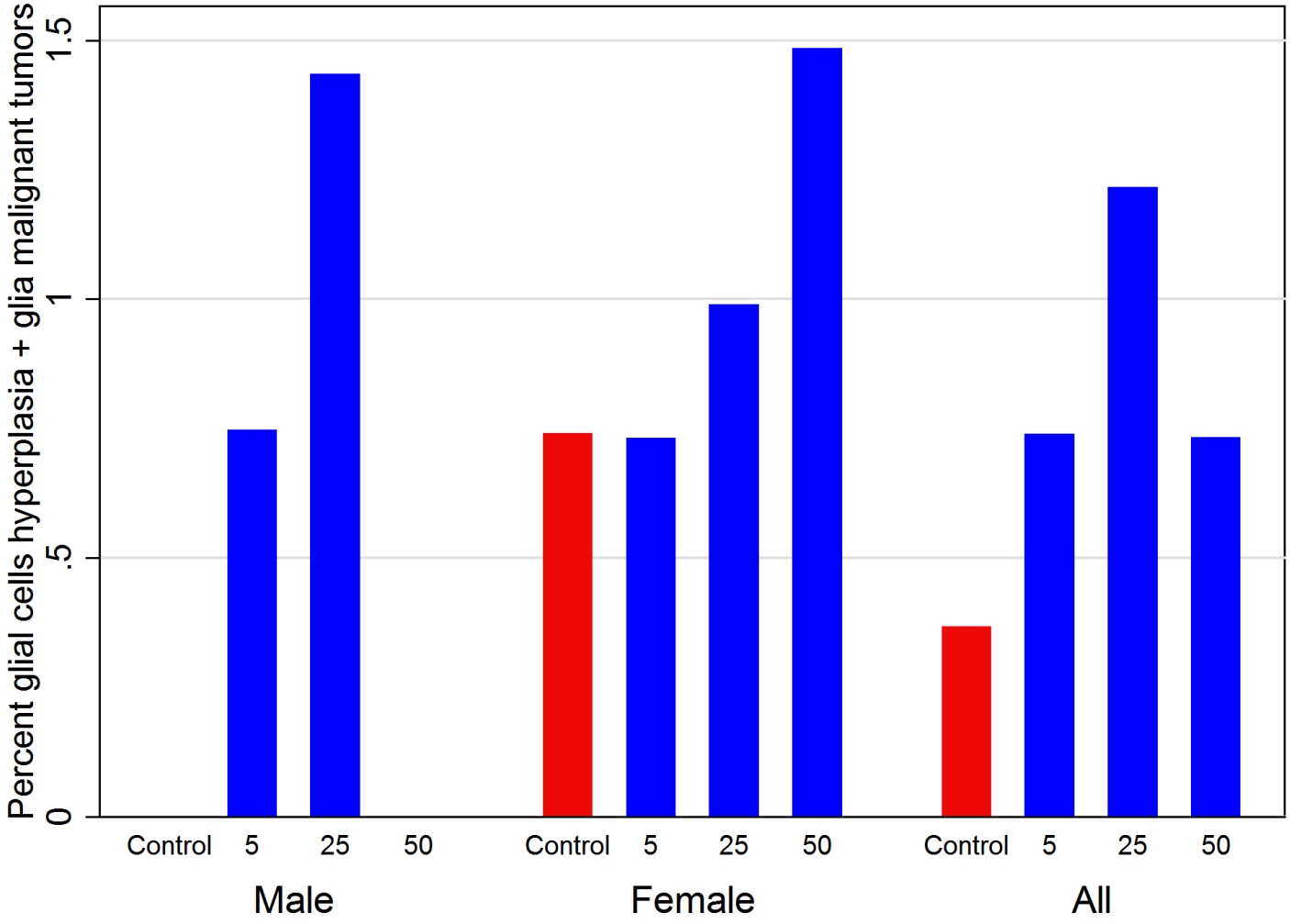
‡ Historical control incidence in NTP studies: 9/699 (1.3%), range 0-6%

* Significant SAR-dependent trend for GSM and CDMA exposures by poly-3 ($p < 0.05$)

** Significant different than controls poly-3 ($p < 0.05$)

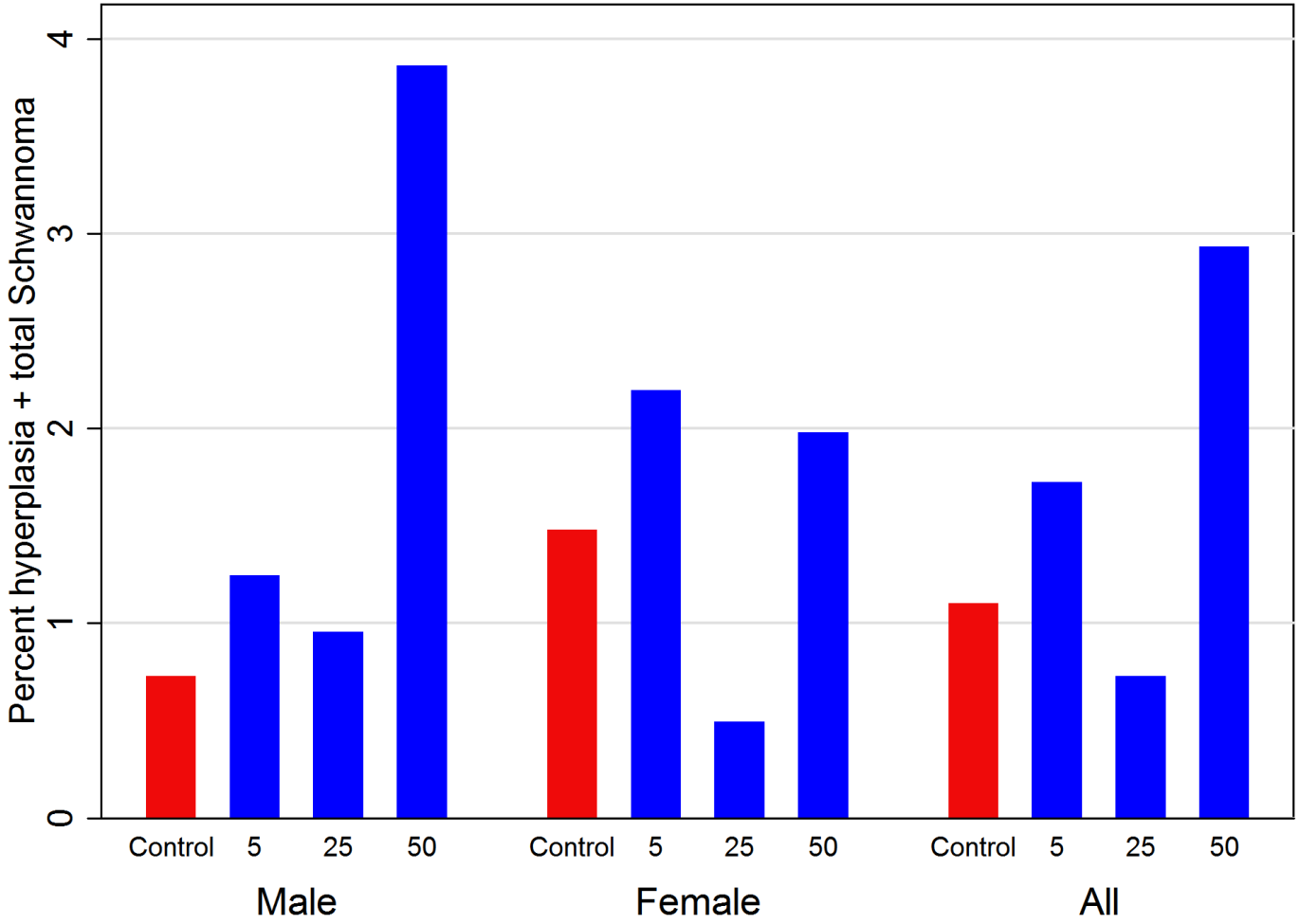
Ramazzini Institute Italy Rat Study

Glia cell proliferation, glioma (V/m)



Ramazzini Institute Italy Rat Study

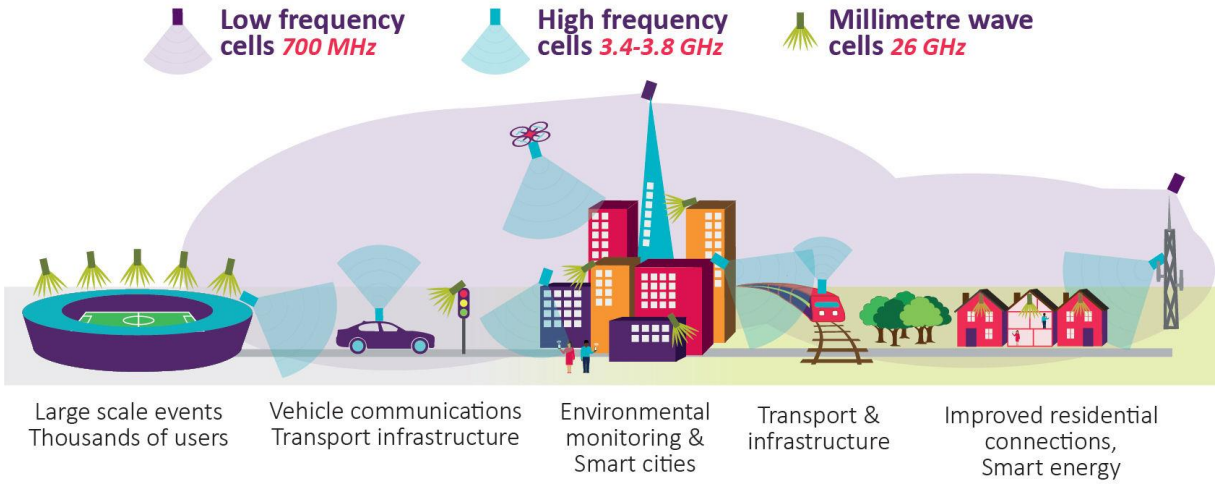
Schwann cell proliferation + Schwannoma ('acusticus neurinoma') V/m



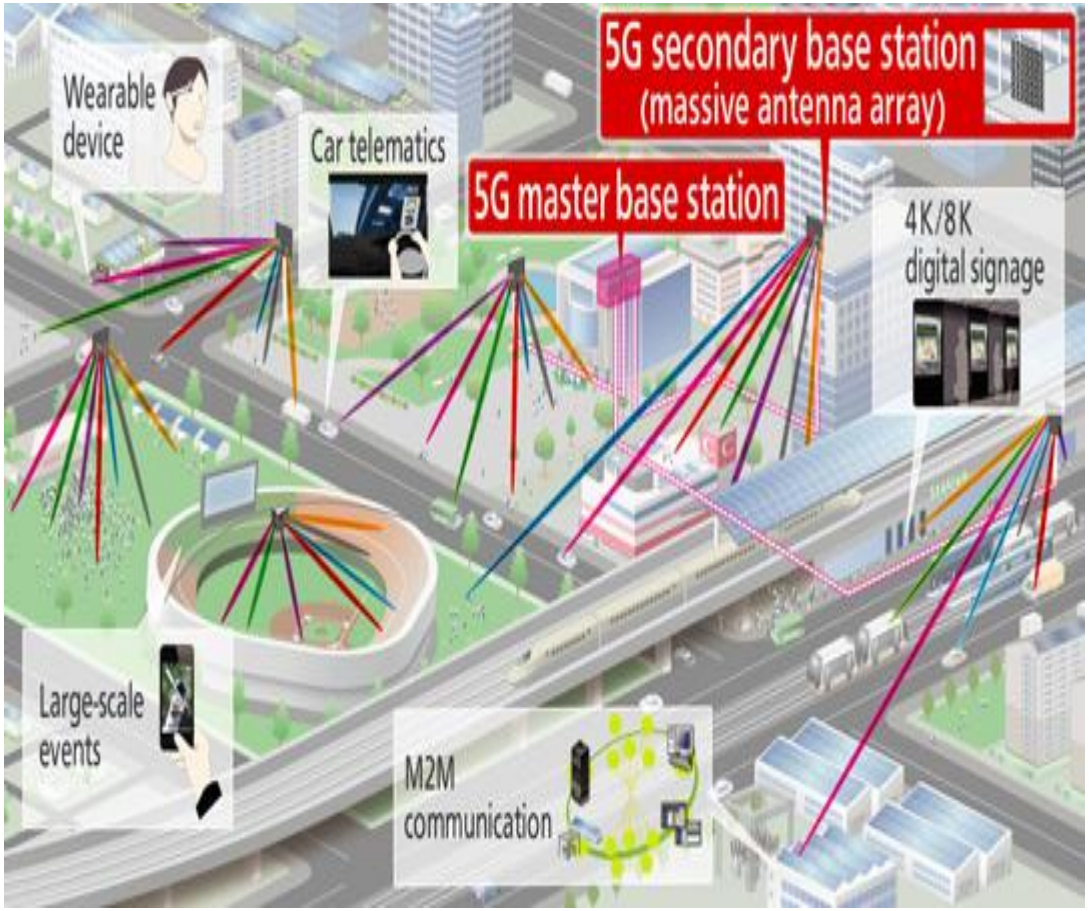
5G

Are there any health risks?

Tallinn June 2019


Low frequency cells 700 MHz
High frequency cells 3.4-3.8 GHz
Millimetre wave cells 26 GHz
Large scale events
Thousands of users
Vehicle communications
Transport infrastructure
Environmental monitoring &
Smart cities
Transport &
infrastructure
Improved residential
connections,
Smart energy


BANK
1
2
2
2
3
4
5
6



Two-way communication

Always trying to get best connection. Higher radiation level when buildnings, trees, vegetation, now, rain, fog etc. are involved

May need indoor antenna

IN-DEPTH ANALYSIS Requested by the ITRE committee (industrifrågor, forskning och energy)

5G Deployment, EU

State of Play in Europe, USA and Asia

Policy Department for Economic, Scientific and Quality of Life Policies
Directorate-General for Internal Policies
Authors: Colin BLACKMAN and Simon FORGE
PE 631.060 – April 2019

Three times more expensive than current system

Driven by Telecom

Convince governments that 5G is needed

Industry influence on governments that 5G is needed

Industry and media claim that there is a race on 5G

What is 5G

Use of 5g for video, down-loading, entertainment, social net-works, IoT

Is 5G safe

Who will pay

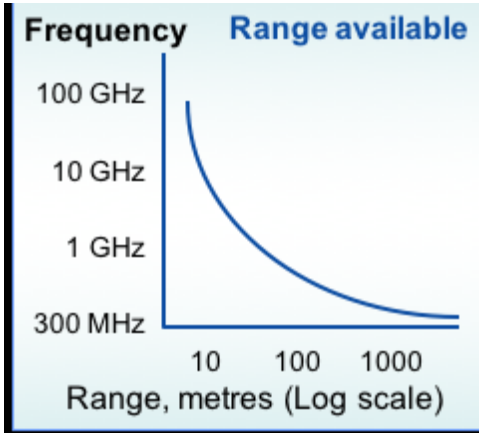
No qiuck-fix; will take longer time to implement, aobut 10 years

This is because the technologies involved with 5G are much more complex. One aspect, for example, that is not well understood today is the unpredictable propagation patterns that could result in unacceptable levels of human exposure to electromagnetic radiation.

The technologies involved with 5G are much more complex. One aspect, for example, that is not well understood today is the unpredictable propagation patterns that could result in unacceptable levels of human exposure to electromagnetic radiation.

Focused beams: Rather than transmitting a wide area broadcast spread over a segment of the cell around a base station, an “active antenna” technique is used to form a set of steerable radio beams with power focused on a small area – the receiving handset

Range reduced by square of distance



Problems
-rain
-snow
-fog
-trees, vegetation (especially during rain)
-buildings, walls, etc

Typical range 20 – 150 meter at higher frequencies

One square kilometer needs about 800 base stations if only 20 m range

All need battery backup

5G Electromagnetic Radiation and Safety

Significant concern is emerging over the possible impact on health and safety arising from potentially much higher exposure to radiofrequency electromagnetic radiation arising from 5G.

Increased exposure may result not only from the use of much higher frequencies in 5G but also from the potential for the aggregation of different signals, their dynamic nature, and the complex interference effects that may result, especially in dense urban areas.

The 5G radio emission fields are quite different to those of previous generations because of their **complex beam formed transmissions in both directions** – from base station to handset and for the return.

Although fields are highly focused by beams, they vary rapidly with time and movement and so are **unpredictable**, as the signal levels and patterns interact as a closed loop system. This has yet to be mapped reliably for **real situations**, outside the laboratory

In line with EECC Article 57, the EU is crafting a regime for SAWAP deployment, aiming for permit-free installation from 2020.

The level of marketing activity is key, with intense lobbying of governments by equipment suppliers and operators – and also of the public by governments.

Recommendation 1:
Increasing R&D efforts on the technology of 5G

Long-term technology research is essential.
One key problem is the unusual propagation phenomena, especially controlling and measuring RF EMF exposure with MIMO at mmWave frequencies for the handset and the base station.

The technology presents challenges to the current level of expertise (based on previous generations of mobile cellular radio engineering) both for suppliers and standards organizations who must incorporate the specifications in future 5G standards

Beamforming – several antenna in the same direction

*"However, since the radiation is concentrated into selected portions of territory, there **may be an increase of EMFs in these points**".*

Chiaraviglio, L., Cacciapuoti, A. S., Martino, G. D., Fiore, M., Montesano, M., Trucchi, D., & Melazzi, N. B. (2018). Planning 5G Networks Under EMF Constraints: State of the Art and Vision. *IEEE Access*, *6*, 51021–51037. https://doi.org/10.1109/ACCESS.2018.2868347

5G

- Skin
- Eyes
- Sweat glands – antenna effect
- Effects on bacteria
- Antibiotica resistance

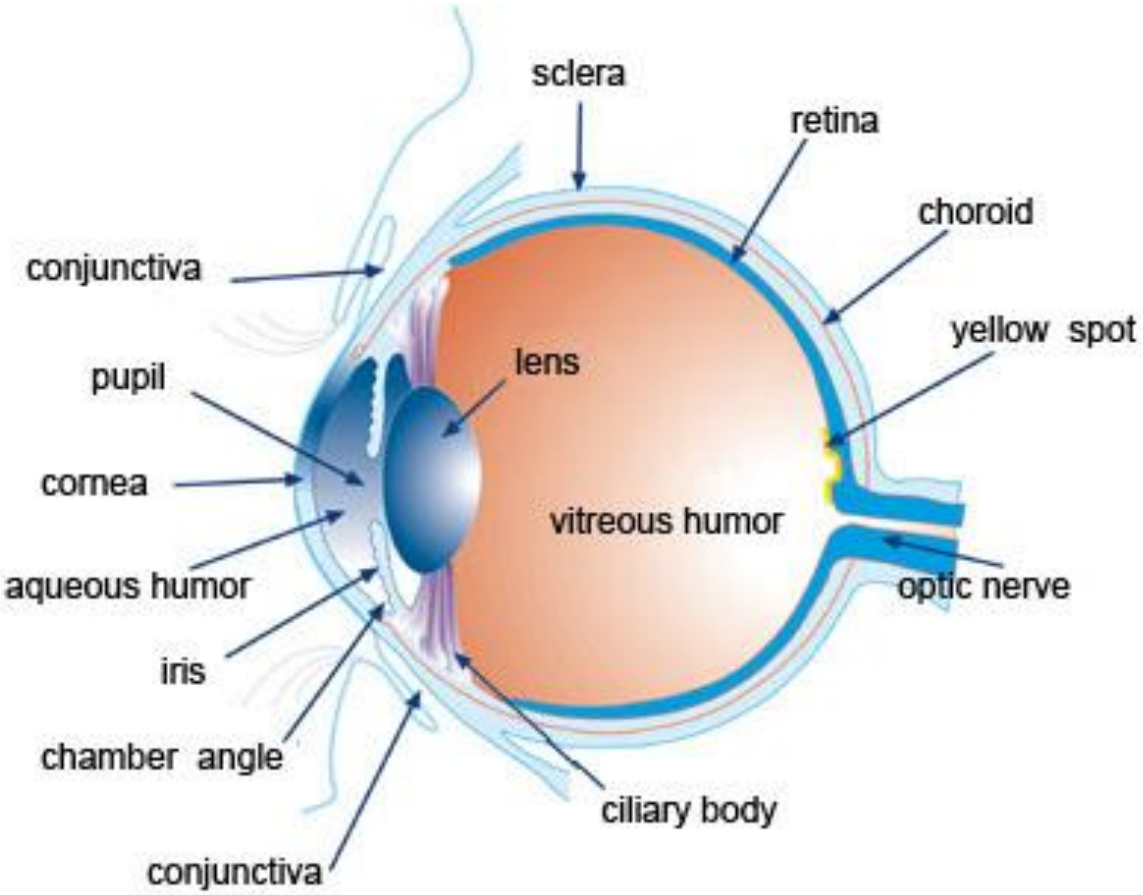
Le Drain 2017, Russell 2018, Feldman 2008, Betzalel 2018, Soghomoyan 2016.

Hence, for a given total output power, SAR may be lowered by "spreading "the power over a larger mass, or equivalently, larger tissue volume. The picture in Figure 1 exemplifies the idea: a given amount of light power captured in a lens can be converted from a harmless state to a harmful one by increasing its density

Permanent tissue damage

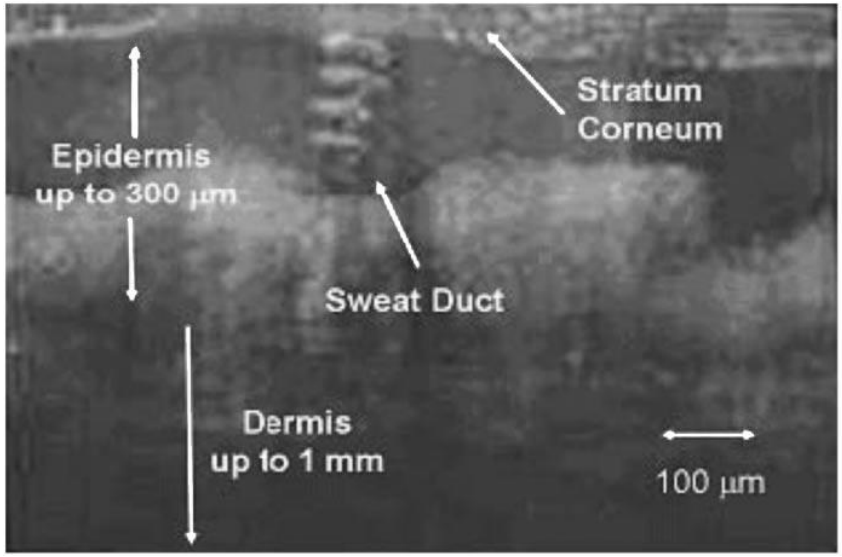
The results also show that the peak-to-average ratio of 1,000 tolerated by the International Council on Non-Ionizing Radiation Protection guidelines may lead to permanent tissue damage after even short exposures, highlighting the importance of revisiting existing exposure guidelines.

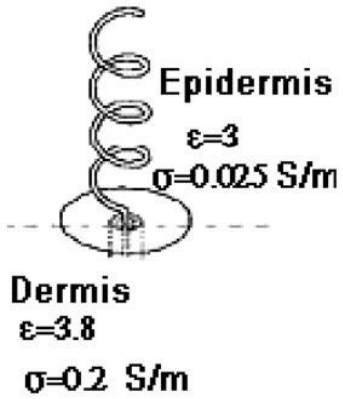
Neufeld, Kuster, Health Phys. 115(6):705–711; 2018


sclera
retina
choroid
conjunctiva
yellow spot
lens
pupil
cornea
vitreous humor
optic nerve
aqueous humor
iris
chamber angle
ciliary body
conjunctiva

Sweat glands in the skin may act as antennas for the 5G signal

Feldman et al 2008



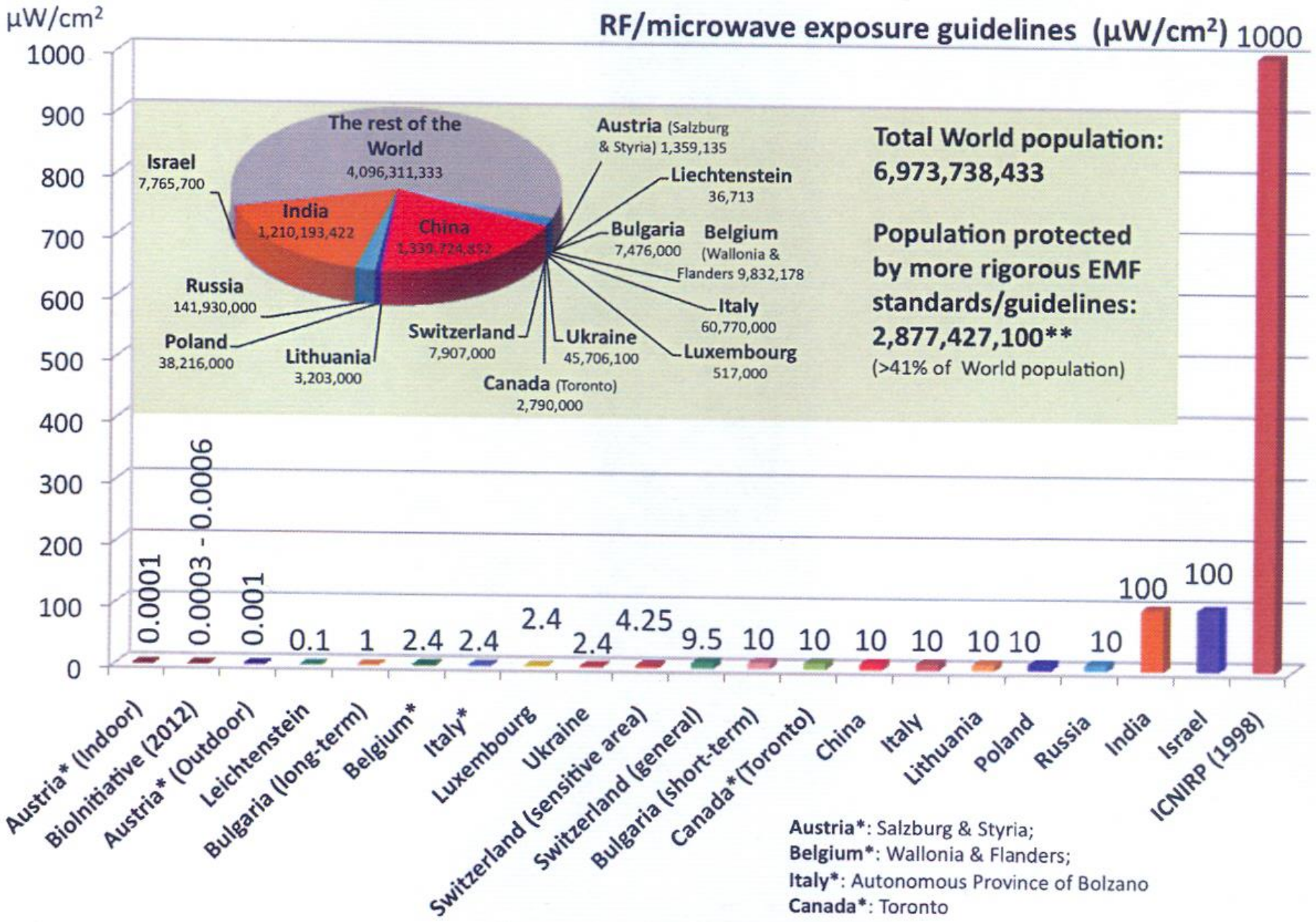


International Commission on Non-Ionizing Radiation

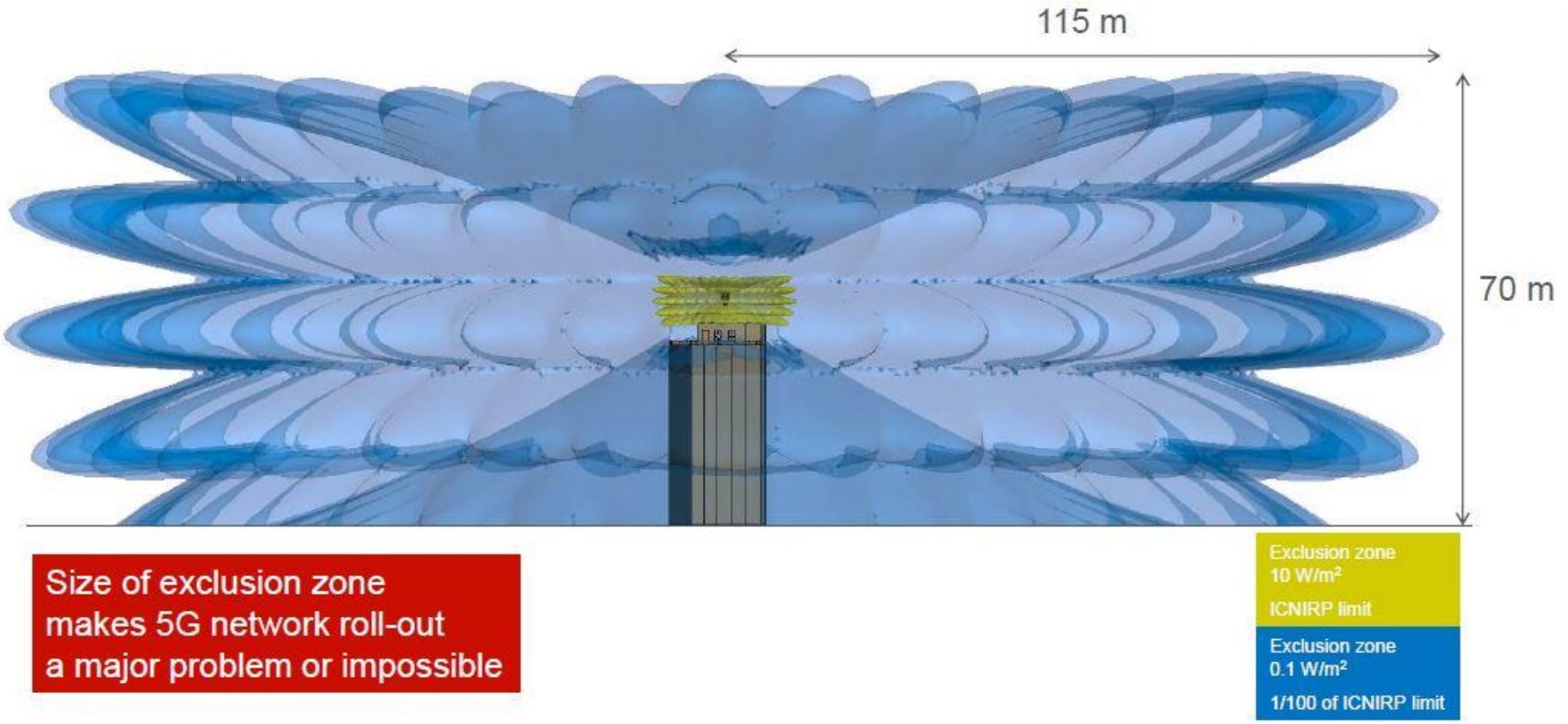
ICNIRP

10 W/m^2 = 61 V/m

Hardell L: World Health Organization, radiofrequency radiation and health - a hard nut to crack (Review). Int J Oncol 51: 405-413, 2017.

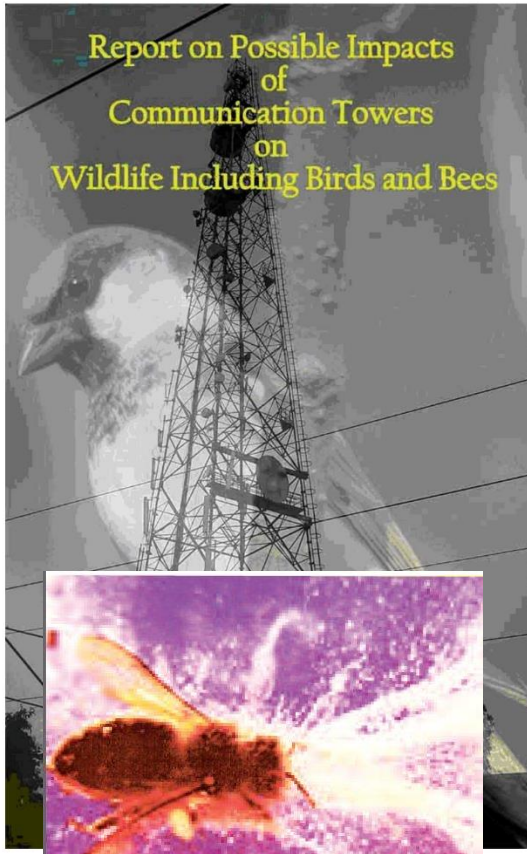

µW/cm²
RF/microwave exposure guidelines (µW/cm²)
1000
900
800
700
600
500
400
300
200
100
0
The rest of the World 4,096,311,333
Israel 7,765,700
India 1,210,193,422
China 1,339,724,852
Russia 141,930,000
Poland 38,216,000
Lithuania 3,203,000
Switzerland 7,907,000
Canada (Toronto) 2,790,000
Ukraine 45,706,100
Luxembourg 517,000
Italy 60,770,000
Belgium (Wallonia & Flanders 9,832,178
Bulgaria 7,476,000
Liechtenstein 36,713
Austria (Salzburg & Styria) 1,359,135
Total World population: 6,973,738,433
Population protected by more rigorous EMF standards/guidelines: 2,877,427,100**
(>41% of World population)
0.0001
0.0003 - 0.0006
0.001
0.1
1
2.4
2.4
2.4
2.4
4.25
9.5
10
10
10
10
10
10
10
100
100
1000
Austria* (Indoor)
BioInitiative (2012)
Austria* (Outdoor)
Leichtenstein
Bulgaria (long-term)
Belgium*
Italy*
Luxembourg
Ukraine
Switzerland (sensitive area)
Switzerland (general)
Bulgaria (short-term)
Canada*(Toronto)
China
Italy
Lithuania
Poland
Russia
India
Israel
ICNIRP (1998)
Austria*: Salzburg & Styria;
Belgium*: Wallonia & Flanders;
Italy*: Autonomous Province of Bolzano
Canada*: Toronto

Exclusion zone makes 5G impossible in countries with lower guidelines; 0.1 W/m^2 gives 115 m exclusion zone!



Källa: https://www.itu.int/en/ITU-T/Workshops-and-Seminars/20171205/Documents/S3_Christer_Tornevik.pdf

Effects on bees, birds and plants by radiofrequency radiation



Three reviews show damage:

Cucurachi *et al.* (2013).
http://www.ncbi.nlm.nih.gov/pubmed/23261519

Balmori (2009):
http://www.ncbi.nlm.nih.gov/pubmed/19264463

Sivani & Sudarsanam (2012).
http://www.biolmedonline.com/Articles/Vol4_4_2012/Vol4_4_202-216_BM-8.pdf

+ http://www.indiaenvironmentportal.org.in/files/file/final_mobile_towers_report.pdf

http://www.ncbi.nlm.nih.gov/pubmed/23915130