

# Comments on RF Exposure Issues Related to Project

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# This Presentation

- **Background: genesis of FCC RF exposure limits**
- **Ongoing reviews of literature by standards setting groups and health agencies**
- **Brief summary of conclusions of officially sponsored reviews of RF health/bioeffects**
  - **Relied on health-agency or other official expert reports**
  - **Brief comments based on health agency review of one study (Dode 2012, presented on June 16 meeting of Trustees by Kent Chamberlin)**
- **Comments on proposed project**

# FCC, IEEE, and ICNIRP Exposure Limits

- **FCC limits**
  - first adopted 1985
  - major revision in 1996
  - **extended without revision 2020**
- **Originally based on IEEE (1982,1992) and NCRP (1986), supported by FDA analysis (2020).**
- **Present FCC limits are similar to two more recent limits: ICNIRP (2020) and IEEE C95.1-2019**
- **Globally,**
  - 135 countries apply ICNIRP 1998 or ICNIRP 2020
  - 11 follow the FCC 1996 limits,
  - 37 have other limits.

# FCC/IEEE/ICNIRP Limits Are Based On

- Protection against **all proven health hazards** of excessive RF exposure to the body
  - Excessive whole-body heating (heat stress)
  - Excessive local heating (burns, corneal damage, thermal pain)

**Table B.10—Established critical temperature levels (produced by RF energy or other types of heating) in various species, organs, or tissues leading to adverse biological effects**

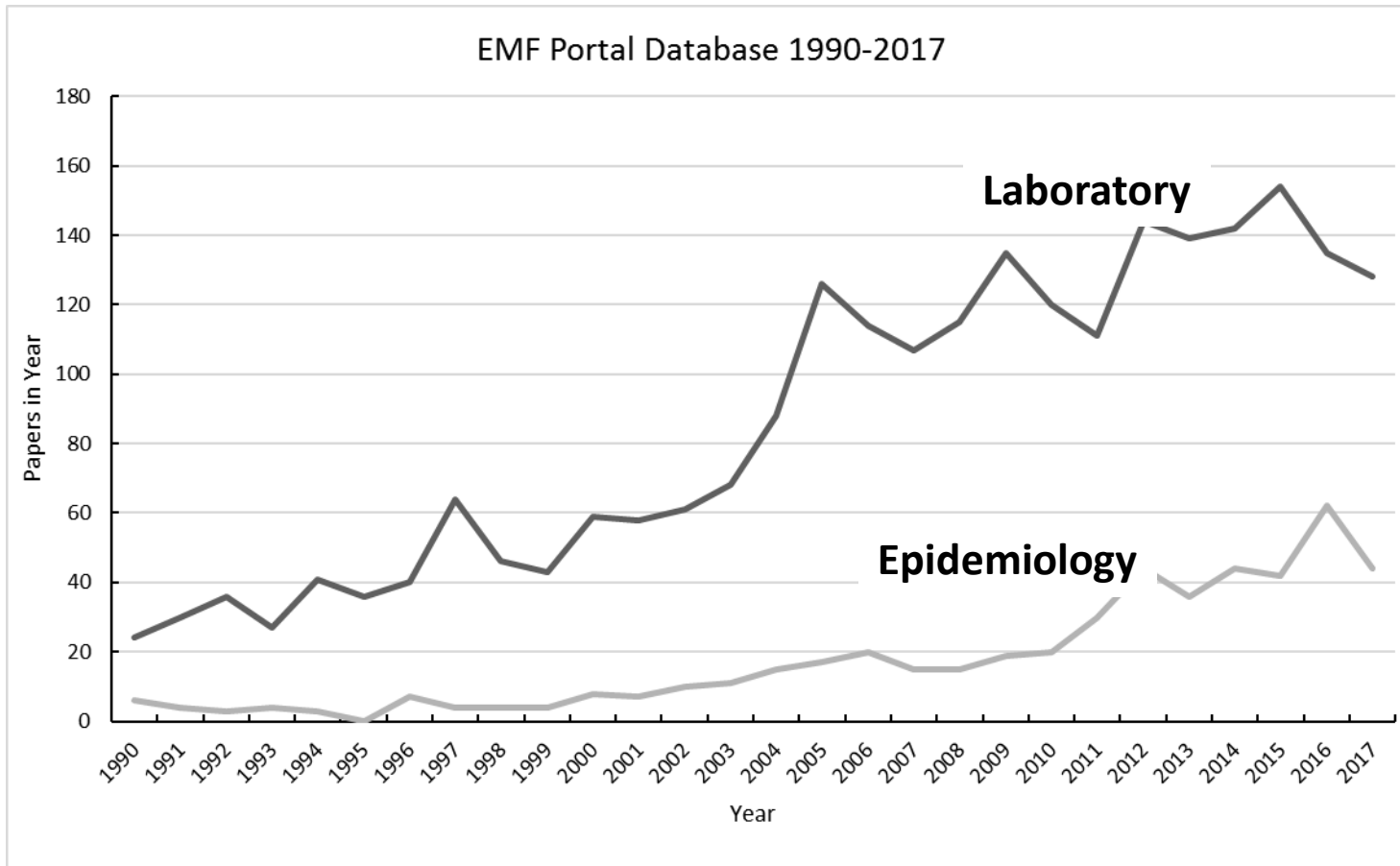
Endpoint	Species/organ/tissue	Threshold (°C) and SAR (W/kg)	Exposure duration	Reference number
Heat stroke	Human (core temperature) Human (brain temperature)	> 42 °C ≥ 40.5 °C	varies with <i>T</i>	Bynum et al. [B220] Cabanac [B223]
CNS deterioration	Human (CNS)	42 °C to 43 °C	varies with <i>T</i>	Bynum [B220]
Skin necrosis	Human	43 °C	10 h to 12 h	Dewhirst et al. [B355]
Skin necrosis	Human	55 °C to 50 °C	3 s to 10 s	
Full thickness burn	Human	45 °C	100 min	
Full thickness burn	Human	60 °C	5 s	
Pricking pain	Human	45 °C	3 s to 10 s	
Thermal injury	Rat, mouse, dog, cat (spinal cord, brain)	43 °C to 44 °C	1 min to 80 min	Dewhirst et al. [B355]
Fetal abnormalities	Rat (whole body)	2 °C to 2.5 °C increase	tens of minutes up to 1 h	Edwards et al. [B385]
Behavioral disruption	Rat (whole body) Monkey (whole body)	1 °C increase, 4 W/kg	40 min to 60 min	de Lorge [B337], [B334] D'Andrea et al. [B322]
Cataract	Rabbit (eye)	> 41 °C (> 150 W/kg)	> 30 min	Kramar et al. [B779] Guy et al. [B550] Carpenter. [B229]
Convulsions	Mouse	$T_{\text{rectal}} = 44 \text{ °C}$		Wright [B1519]
Increase in BBB permeability	Rat	> 40 °C brain temperature (> 4 W/kg WBA SAR)	4 h	Merritt et al. [B1001] Finnie et al. [B420], [B419] Sharma and Hoopes [B1285]

# Other Examined Endpoints by IEEE, ICNIRP

Brain electrical activity and cognitive performance	Neurodegenerative diseases
Symptoms and wellbeing	Cardiovascular system, autonomic nervous system, and thermoregulation
Other brain physiology and related functions	Immune system and haematology
Auditory, vestibular, and ocular function	Fertility, reproduction, and childhood development
Neuroendocrine system	Cancer

**IEEE and ICNIRP failed to find convincing evidence for hazard below exposure limits**

# More than 100 Papers Per Year on RF Bioeffects



**Frequent and ongoing reviews by:  
health agencies in several countries  
standards setting groups (IEEE, ICNIRP)**



# Reviews of the Literature Are An Ongoing Process By Many Health Agencies

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## 2020

International	<a href="#">Guidelines for limiting exposure to electromagnetic fields (100 kHz to 300 GHz)</a> . International Commission on Non-Ionizing Radiation Protection (ICNIRP). Health Physics. 118(5):483-524. May 2020
International	<a href="#">World Cancer Report: Cancer Research for Cancer Prevention</a> . International Agency for Research on Cancer (IARC). 4 February 2020.
USA	Review of Published Literature between 2008 and 2018 of Relevance to Radiofrequency Radiation and Cancer. Food and Drug Administration (FDA). February 2020 - <a href="https://www.fda.gov/">https://www.fda.gov/</a>
Sweden	Recent Research on EMF and Health Risk, <a href="#">Fourteenth report from SSM's Scientific Council on Electromagnetic Fields</a> , Strålsäkerhetsmyndigheten (Swedish Radiation Safety Authority), 2020:04, April 2020

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## 2019

Austria	<a href="#">WBF Expertenforum 2019</a> , Wissenschaftliche Beirat Funk (WBF), 2019.
International	IEEE Standard for Safety Levels with Respect to Human Exposure to Electric, Magnetic, and Electromagnetic Fields, 0 Hz to 300 GHz. IEEE International Committee on Electromagnetic Safety. C95.1-2019. 4 October 2019 - <a href="https://ieeexplore.ieee.org/document/8859679">https://ieeexplore.ieee.org/document/8859679</a>
Italy	Radiazioni a radiofrequenze e tumori: sintesi delle evidenze scientifiche [Radiofrequency radiation and tumors: synthesis of scientific evidence]. Istituto Superiore di Sanità. Rapporti ISTISAN 19/11. August 2019 - <a href="https://www.iss.it/">https://www.iss.it/</a>
USA	Report and Order in the matters of ET Docket No. 03-137 (terminated), ET Docket No. 13-84 (terminated) and ET Docket No. 19-226. Federal Communications Commission. 4 December 2019 - <a href="https://www.fcc.gov/">https://www.fcc.gov/</a>
Sweden	Recent Research on EMF and Health Risk, Thirteenth report from <a href="#">SSM's Scientific Council on Electromagnetic Fields</a> , <a href="#">Strålsäkerhetsmyndigheten</a> (Swedish Radiation Safety Authority), 20019:08, June 2019



# The Best Reviews Are:

- Done under **auspices of official agency** (i.e. health agency)
- Done by **panel of experts** with varying specialty
- **Operating under clearly specified protocols**
- **Comprehensive intake of papers** (no cherry picking)
- Include **critical assessment** of studies (give little weight or disregard poor quality studies)

Such reviews are very time consuming (multiple person-years of effort by qualified experts)

In preparing this presentation I examined all available expert reports under health agency sponsorship (English, French) over past 10 years for:

- Conclusions regarding hazards at exposure levels below FCC/ICNIRP/IEEE limits
- Comments on Dode 2012

# France 2019

**ANSES, (Agency for Food, Environmental and Occupational Health & Safety), 2019 Expositions aux champs électromagnétiques liées au déploiement de la technologie de communication 5G et effets sanitaires éventuels associés**

Available on the Internet at  
<https://afpa.org/content/uploads/2018/03/ANSES-Hypersensibilit%C3%A9-aux-champs-%C3%A9lectromagn%C3%A9tiques-2018-03.pdf> (accessed June 1, 2021.) For an English summary see  
<https://www.anses.fr/en/content/hypersensitivity-electromagnetic-waves-research-efforts-should-be-scaled-and-suitable-care>

(241 pages)

**“5G: no new health risks in view of the available data”**

<https://www.anses.fr/fr/content/5g-pas-de-risques-nouveaux-pour-la-sant%C3%A9-au-vu-des-donn%C3%A9es-disponibles>

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(241 pages)

- “current scientific knowledge shows **no cause and effect relationship** between the symptoms of people declaring themselves as electrohypersensitive and their exposure to electromagnetic waves”

## US 2020

Review of Published Literature  
between 2008 and 2018 of  
Relevance to Radiofrequency  
Radiation and Cancer. Food and  
Drug Administration (FDA).  
February 2020

<https://www.fda.gov/>

(112 pages)

- “Based on the FDA’s ongoing evaluation, the available epidemiological and cancer incidence data continues to support the Agency’s determination that there are **no quantifiable adverse health effects in humans caused by exposures at or under the current cell phone exposure limits**”

# Sweden 2020

Recent Research on EMF and Health Risk, [Fourteenth report from SSM's Scientific Council on Electromagnetic Fields](#)

(Swedish Radiation Safety Authority), 2020:04, April 2020

(72 pages)

- **“No new established causal relationships between EMF exposure and health risks have been identified. ..The results of the research review give **no reason to change any reference levels or recommendations in the field.** “**

# Belgium 2018

Rapport du comité d'experts sur les radiations non ionisantes. 2017-2018 [Report of the Committee of Experts on non-ionizing radiation 2017-2018]. [Brussels Environmental Department](#). 8 January 2018.

(34 pages)

- “...the overall conclusion remains the same as the one formulated in the previous report (2015-2016) for the reasons mentioned at the time (marginal effects, inadequate studies, irrelevant exposures, etc.).... **research is still unable to demonstrate that "normal" intensities (below the ICNIRP international recommendations) may result in adverse health effects** or non-specific symptoms such as headache and dizziness. That means not that there are no effects, but that for the moment it has not yet been possible to identify and prove them with sufficient clarity.”

# Evaluation of “Brazilian study” (Dode (2012)) by Health Agencies

- Most health-agency reviews ignored the study
- Swedish Radiation Safety Authority Scientific Council on Electromagnetic Fields (2013):

“...even though the authors had information available regarding age and sex distribution of the areas, this was not taken into account in their calculation. Urban areas may differ in many ways from less urban areas with lower base station density.... **In summary, this study is uninformative.**”
- FDA (2020):

“...there was **no information on actual exposure levels** to RFEMF for individuals from the base stations, consideration of other sources of RFEMF, correction for age/demographic factors associated with different sectors in this city. Increased cancer deaths occurred within the first year of BS installation, **inconsistent with the etiology of cancer development.**”

# Proposed Project

- A **generic wireless base station** – similar to many thousands already installed in the UE
- RF compliance analysis by C Squared Systems (2/7/20) is a **credible analysis and results are as expected** from the proposed installation

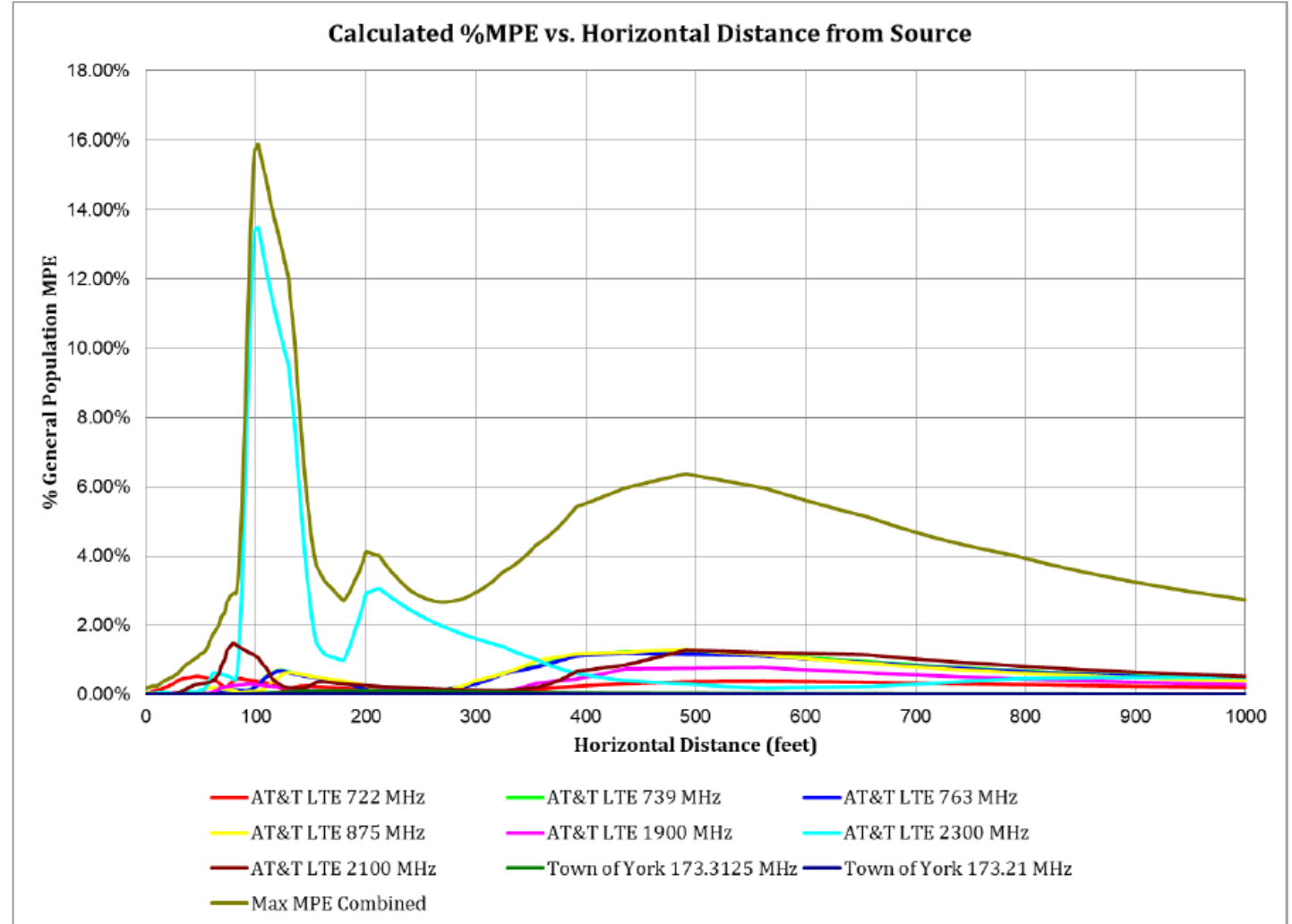


Figure 1: Graph of General Population % MPE vs. Distance



# General Observations

- In general, a stronger base station signal will *reduce* RF exposure to the user of (an AT&T) handset due to adaptive power control
- Weak signal area - AT&T will probably have to install a base station in the vicinity (tower) to satisfy service needs