



# Gaps in assessment Gaps in protection

IIAS/EHT Expert Forum 2017

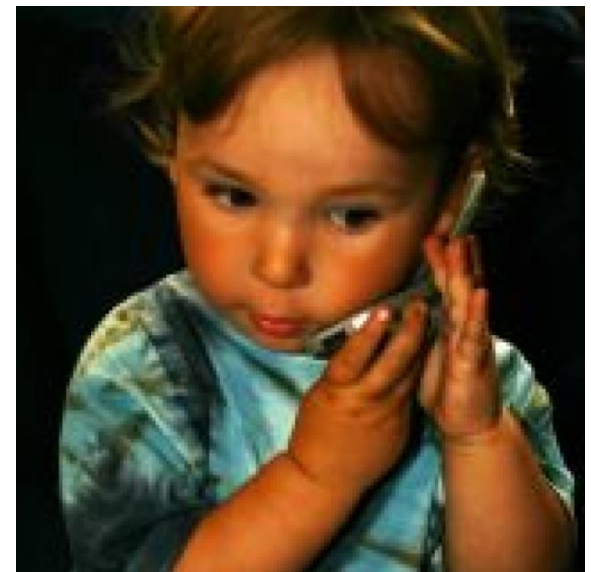
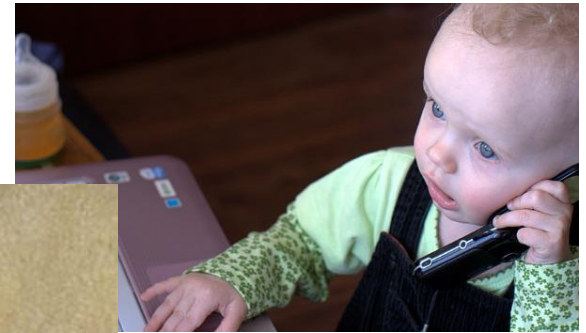
**Dr. Yael Stein MD**

Department of Anesthesia and Critical Care Medicine  
Hadassah Medical Center, Jerusalem, Israel

# Contents:

- 1. Cumulative exposure assessment**
- 2. Gaps in protection**

# Exposure assessment





A photograph of a park fountain at night. The fountain has multiple jets of water, some of which are illuminated with green and yellow lights. In the background, a city skyline is visible through the trees. The sky is dark with some clouds. A text overlay is present in the lower center of the image.

**RF-EMF is an environmental pollutant**

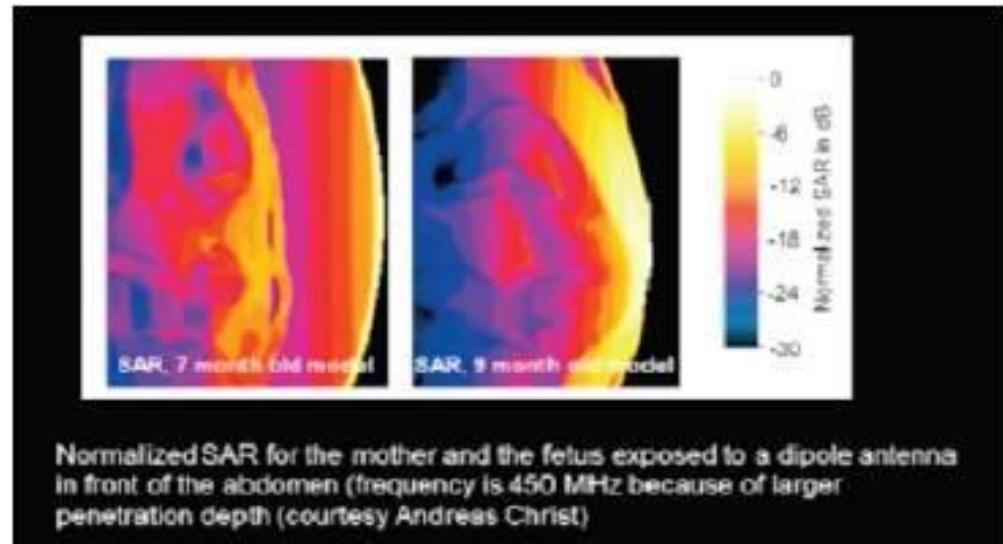
schoolchildren



**Cumulative exposures**

# Babies

- Laptops near pregnant abdomen?
- Baby monitor transmitters near soft skull & brain?



**Protect  
the ones  
you love.**





# Exposure assessment - cellphones

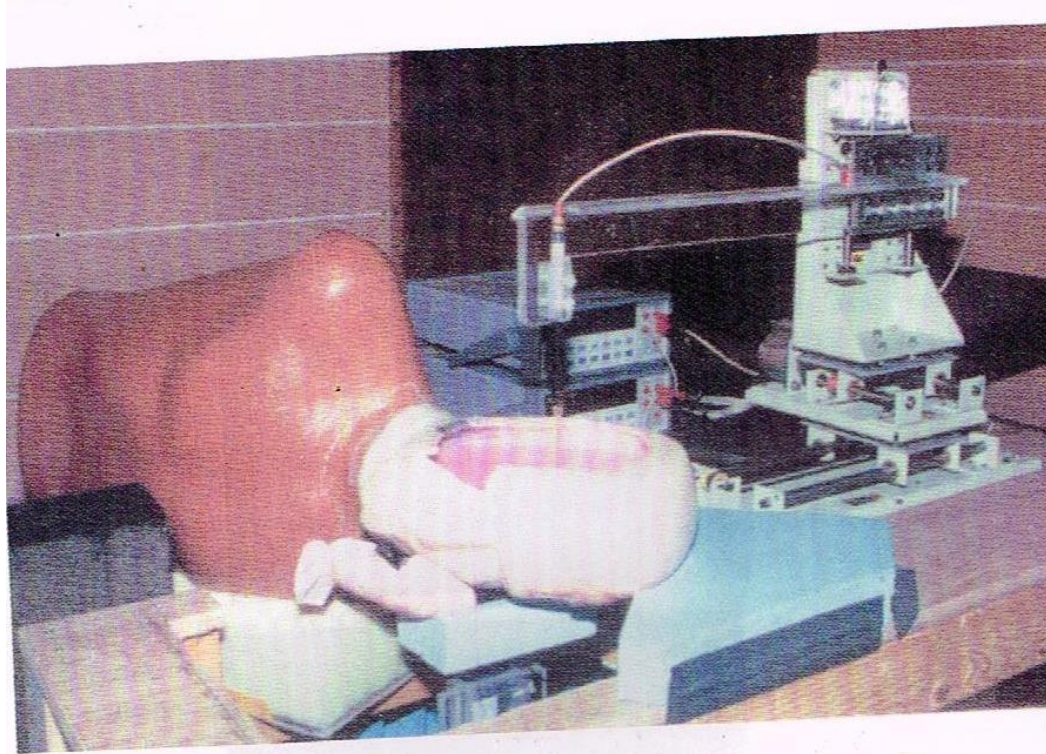


Figure 8 The 3-D stepper-motor-driven automated SAR measurement system.

**SAM**

Specific Anthropometric Mannequin

# **Underestimation of EMF/NIR Exposure for Children for Mobile Telephones and for Electronic Article Surveillance (EAS) Systems**

**Om P. Gandhi**

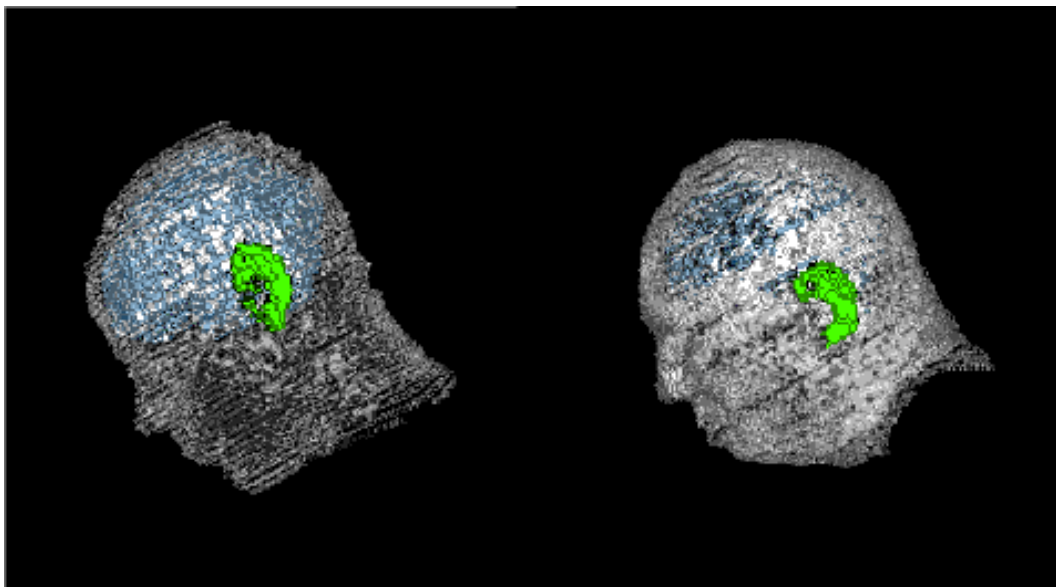
Department of Electrical & Computer Engineering  
University of Utah  
Salt Lake City, UT 84112 U.S.A.

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Invited paper presented at the International NIR and Health  
Workshop- Brazil, May 18,19,2009.



# FDTD Modeling is superior to SAM



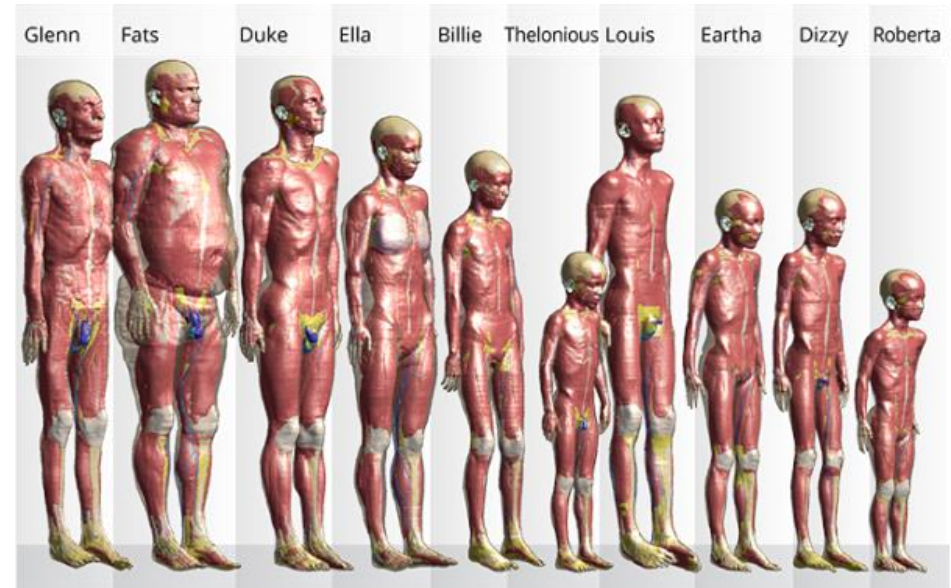
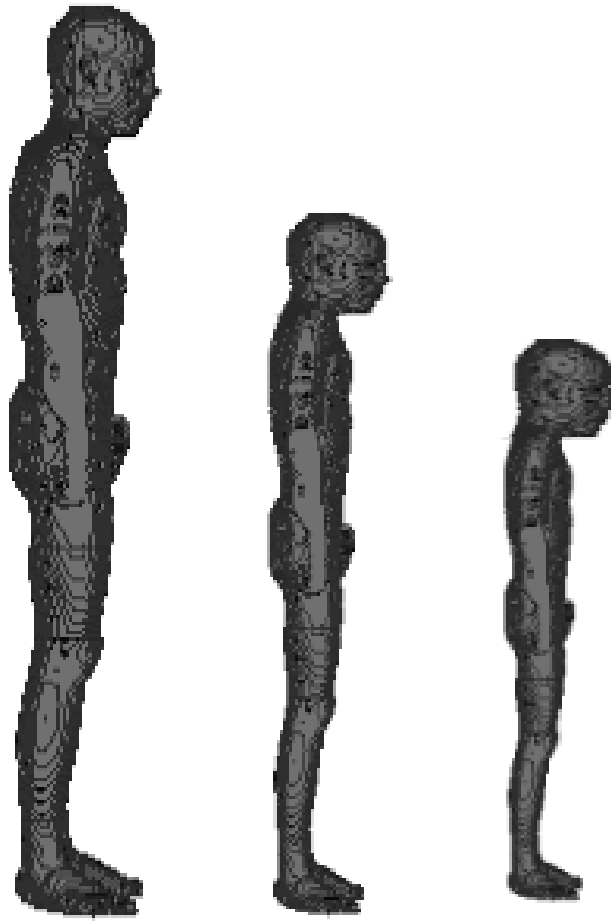
Gandhi &  
Kang, *Phys.  
Med. Biol.*,  
47:1501-18,  
2002

The Utah Model and Visible Man model at 1900 MHz

the two anatomically-based 30°-tilted head models  
used for SAR calculations

The 6-10 mm thick plastic “pinna” used for SAM  
underestimates SAR

# The Virtual Population (ViP) model phantoms -- IT'IS Foundation



Gandhi's anatomic models 2001

Children absorb more radiation than adults



Courtesy Dr. P. Gandhi and Queen's University

December 12, 2012

American Academy of Pediatrics

DEDICATED TO THE HEALTH OF ALL CHILDREN™



The Honorable Dennis Kucinich  
2445 Rayburn House Office Building  
Washington, DC 20515

## Children are disproportionately affected by environmental exposures, including cellphone radiation

our support of H.R. 6358, the *Cell Phone Right to Know Act*.

**The difference in bone density and the amount of fluid in a child's brain...** could allow children to absorb greater quantities of RF energy deeper into their brains than adults

quantities of RF energy deeper into their brains than adults. It is essential that any new standards for cell phones or other wireless devices be based on protecting the youngest and most vulnerable populations to ensure they are safeguarded through their lifetimes.



# Home Cordless phones

2002

NONSTOP PULSED 2.4 GHZ RADIATION INSIDE US HOMES

2nd International Workshop on Biological Effects of Electromagnetic Fields 7-11 Oct 2002

## NONSTOP PULSED 2.4 GHZ RADIATION INSIDE US HOMES

THOMAS HAUMANN<sup>1</sup> AND PETER SIERCK<sup>2</sup>

<sup>1</sup>Umweltanalytik und Baubiologie,  
Meisenburgstrasse 25, D-45133 Essen, Germany

<sup>2</sup>Environmental Testing & Technology, Inc.,  
1106 Second Street, Encinitas CA 92024, USA

The radiation levels from the GIGASET located in the same room are **even higher than encountered in proximity (50 to 100 feet) to most cellular base stations** located on pole mount positions or on top of office buildings

## A sentinel case series of cancer patients with occupational exposures to electromagnetic non-ionizing radiation and other agents

Yael Stein, Or Levy-Nativ, Elihu D. Richter

Eur. J. Oncol., vol. 16, n. 1, pp. 21-54, 2011

Eur. J. Oncol. - Vol. 16 - N. 1 - March 2011

Eur. J. Oncol. - Vol. 16 - N. 1 - Marzo 2011

ISSN 1128-6598

# EUROPEAN JOURNAL OF ONCOLOGY

## GIORNALE EUROPEO DI ONCOLOGIA

Official Organ of the  
Italian Society of Tumours  
SIT  
Prevention, Diagnosis, Therapy

Organo Ufficiale della  
Società Italiana Tumori  
SIT  
Prevenzione, Diagnosi, Terapia

Latency < 5 years		Exposure: Immediate environment	Exposure: Background/ external - outdoors	Age at initial exposure & Sex	Duration (years)	Latency (years)	Diagnosis
Solid							
Brain Glioma/ Astro	ELF	High-power electronic equipment & powerline >3-4 mG		25 M	2	2	C71.1 – Malignant neoplasm of brain stem. M9440/3 – Glioblastoma NOS  Died
1	RF/MW	Maintenance of receiving and transmitting RF/MW equipment	Antennas				
	Other exposures	Ionizing Radiation: Outdoors - Direct contact with wave guides, emitting X, α, β radiation					
Comments:		Intense exposure during 6 wks. Previously suffered head trauma. Co-worker with glioblastoma					

# Multi-modal exposures

# Home exposures



## **Chapter 57. Electromagnetic radiation and health: Human indicators**

**Yael Stein, Osmo Hänninen<sup>1,\*</sup>, Paavo Huttunen<sup>2</sup>,  
Mikko Ahonen<sup>3</sup> and Reijo Ekman<sup>4</sup>**

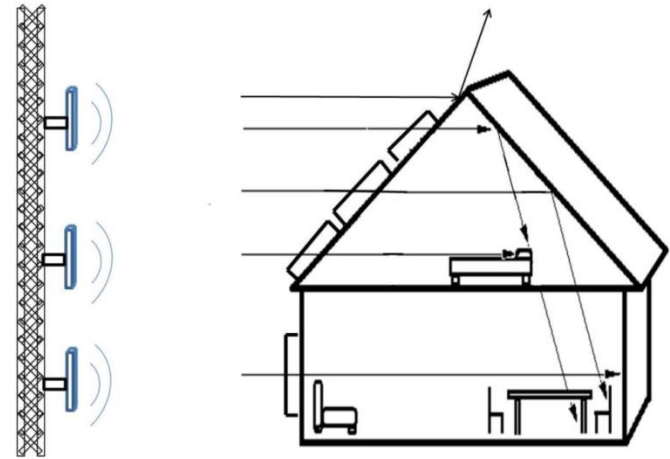
**Humans and all living organisms are receiving antennas for electromagnetic radiation**

Atoms, molecules and ions in human tissues interact with the electromagnetic waves, for example **iron**, present in many catalysts, haemoglobin and other carriers of oxygen, and **magnetite crystals**



# Building materials

- **Steel-reinforced concrete**
- Roofs and walls often do not enable electromagnetic radiation to penetrate
- Are reflective



- Radiation from an external source can enter a building through the side walls.
- **is then reflected inside the building**
- Reflections can interact - form **standing waves and hot spots**

# Masts / Antennas

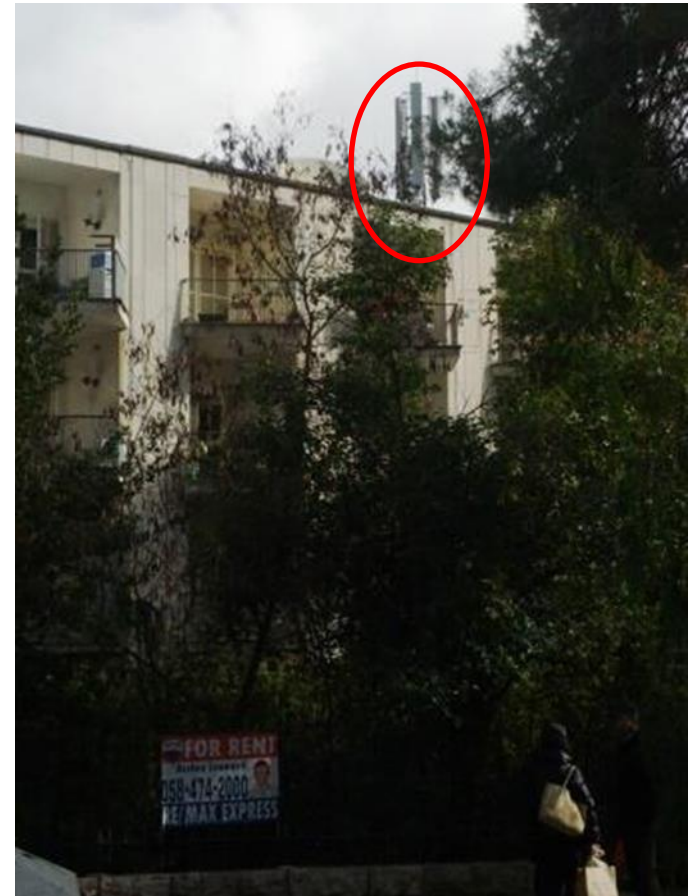
RF & ELF

ELF

RF



# Ground floor 4 room appt w garden, Katamon





## Recreation under the masts...



**MAST  
SHARING?**

## Teenagers' home exposures



A = WiFi Router

C = WiFi Radio

B = WiFi Phone

D = WiFi Laptop

**FAVORITE POSITION IN  
BED?**

**NEAR THE WALL SO I CAN USE MY  
PHONE WHILE IT'S CHARGING**

memegenerator.net



# School



Photographed by parent  
in **1<sup>st</sup> grade classroom**





# Home Wi Fi

- Less devices
- May be switched off



## School Wi Fi

- **Many radiating devices**
- Is not fully turned off
- Environmental pollution during weekends...

# Laptops

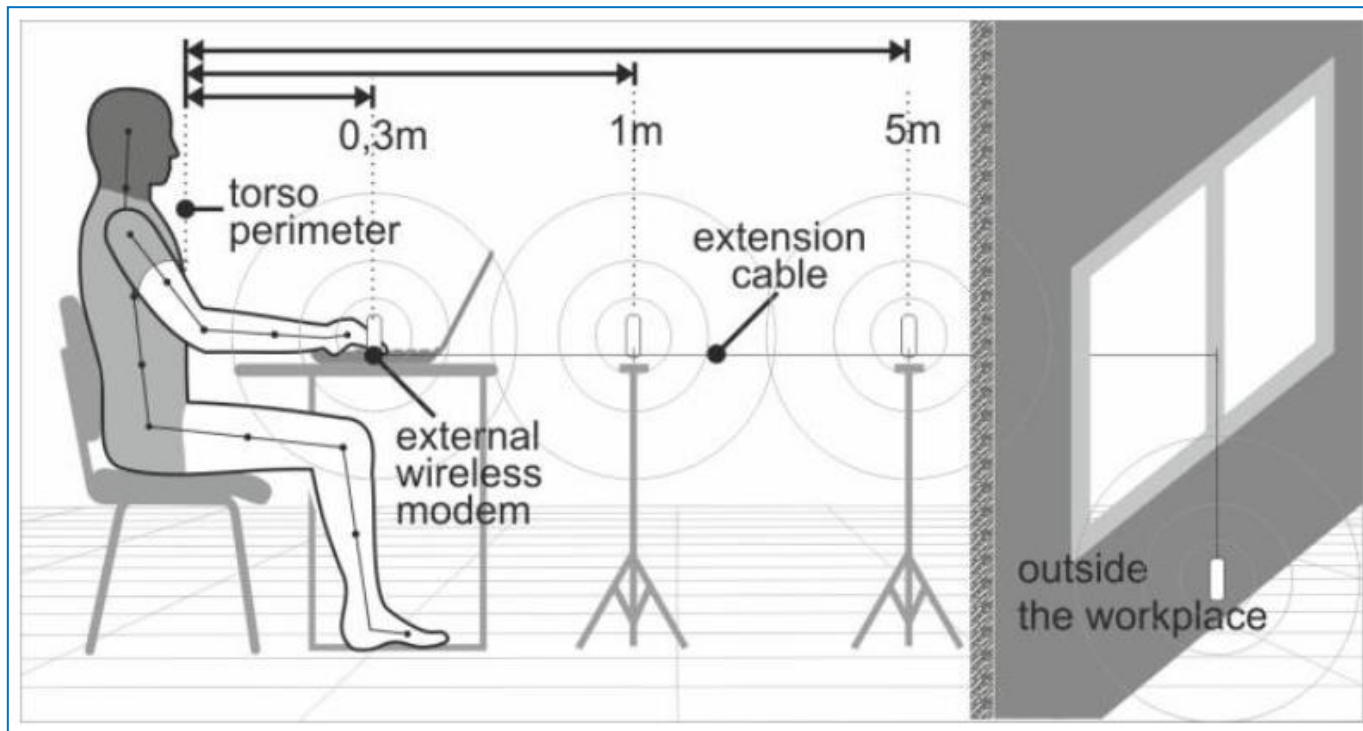
Besides radiofrequency fields, laptop computers also generate a range of other frequencies:

- **extremely low frequencies (ELF),**
- **ultra-low frequencies (ULF),**
- **very low frequencies (VLF),**
- **low frequencies (LF)**
- **medium frequencies**

# Reducing Exposure to Radiofrequency Electromagnetic Fields from Wireless Networking with Portable Computers

Tarmo Koppel<sup>1</sup>, Inese Vilcāne<sup>2</sup>, Mikko Ahonen<sup>3</sup>,

*Safety of Technogenic Environment* **2014**



The exposure was tested under different distances between the user and the antenna (**0.3 m, 1 m, 5 m and outside the workplace**)

# Multiple devices in class



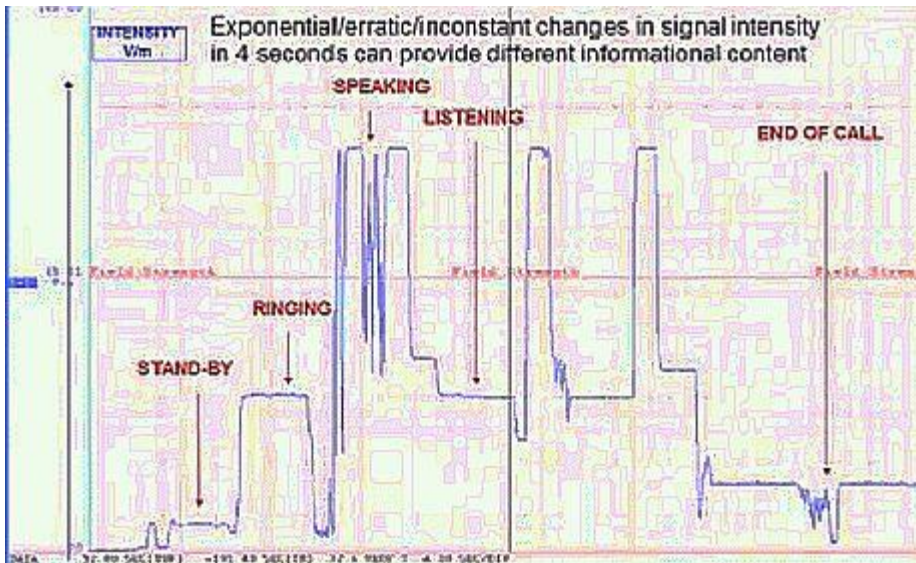


# Standards based on Averaged intensity calculations?

## Variation in signal intensity - cellphone

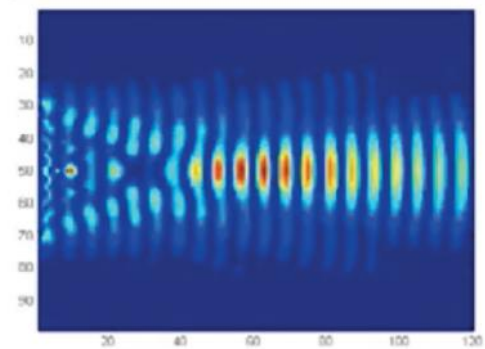
Patterns of signal change may be more biologically important than average exposure

change in power density within 4 seconds of a phone call:



Margaritis and Fragopoulou,  
University of Athens

## Complexity of the cellphone signal



Margaritis and Fragopoulou,  
University of Athens

## IEEE 802.11™: Wireless LANs

### Wi Fi wLAN protocol

2.4 – 5 billion pulses per second

#### **802.11 – wireless LANs** (Local Area Networks)

provides 1 - or 2-Mbps transmission in the 2.4 or 5 GHz band using either:

- **frequency-hopping spread spectrum** (FHSS) or
- **direct-sequence spread spectrum** (DSSS)

#### Beacon Interval Field

- ❑ In 1024  $\mu$ s Time Units (TUs)
- ❑ Typically 100 TUs or about 0.1 Seconds

**Beacon  
signal**

Prof. Dr. Lebrecht von Klitzing  
Umweltphysikalische Messungen GbR  
Schwimmbadweg 21  
D-36466 Wiesenthal  
Germany

## **Declaration of Prof. Lebrecht von Klitzing On EHS**

I, Prof. Dr. rer. nat. Lebrecht von Klitzing, *under penalty of perjury, hereby make the following declaration in support of an injunction to ban Wi-Fi in schools in Israel, in a case submitted to the Israeli Supreme Court (Docket Number: 6269/12) and provide this declaration to prove that EHS is a condition caused by electromagnetic radiation to which biological markers exist:*

**My experiments also demonstrated that people with EHS reacted to Wi-Fi with a power density that is 50 times lower than that from cordless phones. This finding suggests that the impact of Wi-Fi on the body is occurring in lower radiation intensities.**

**A possible explanation may involve the fact that Wi-Fi modulation uses a 10 Hz frequency, which is in the range of the human Alpha Brainwaves, which range from 8-13 Hz.**

1980

# THE EFFECT OF AIR IONIZATION, ELECTRIC FIELDS, ATMOSPHERICS AND OTHER ELEC- TRIC PHENOMENA ON MAN AND ANIMAL

FELIX GAD SULMAN

M.D., D.V.M.

Bioclimatology Unit  
Hebrew University Medical Center  
Jerusalem, Israel

All modern aspects of bioclimatology are covered in this book. Concentrating on basic information and its practical application in medicine and meteorology, the author reviews and analyzes the electric factors (ions, statics, electrostatics) that affect health and their connection to the forces that govern weather and climate. Information is also presented on the implications of weather manipulation.



American Lecture Series

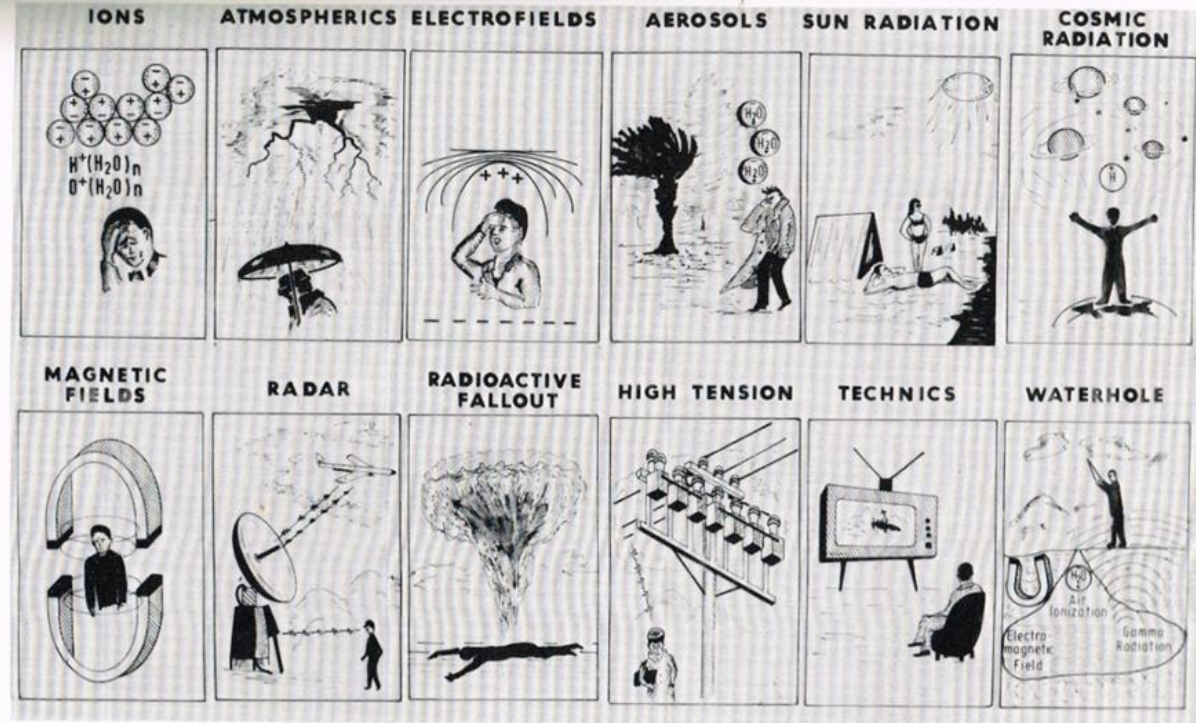


Figure 1. Twelve sources of air electricity and their impact on man.

12 sources of electricity and their impact on man



Felix Sulman, Pharmacy school, Hebrew University of Jerusalem, 1980

Evidence is accumulating that **pulsed radiation can be more effective in producing biologic effects** than continuous radiation

- Pulsing?
- Repetition rate?
- Peak power?

**Are the effects additive? Synergistic?**



Charalabos C. Papageorgiou et al.  
*J. Integr. Neurosci.* 2011; **10**, 189

## Effects of Wi-fi signals on the P300 component of event-related potentials during an auditory Hayling task

**Wi-Fi exposure may exert gender-related alterations on neural activity associated with the amount of **attentional resources** engaged during a linguistic test adjusted to induce WM**

The P300 component of (ERPs) is believed to **index attention and working memory (WM) operation of the brain**

- 15 M , 15 F subjects (age / education matched)
- performed a modified version of the Hayling Sentence Completion test, adjusted to induce WM
- ERPs were recorded at 30 scalp electrodes, both without and with the exposure to a Wi-Fi signal

P300 amplitude values at 18 electrodes were found to be **significantly lower in the response inhibition condition** than in the response initiation and baseline conditions

Within the response inhibition condition - 15 leads had **decreased P300 amplitudes of males in comparison to female subjects only at the presence of EMF**

UNITED  
NATIONS

**CRC**



**Convention on the  
Rights of the Child**

Distr.  
GENERAL

CRC/C/GC/12  
20 July 2009

Original: ENGLISH

COMMITTEE ON THE RIGHTS OF THE CHILD  
Fifty-first session  
Geneva, 25 May-12 June 2009

**GENERAL COMMENT NO. 12 (2009)**

**The right of the child to be heard**

## **Pulsed wave exposure from “Smart meters” in every home?**

### **Article 27**

1. States Parties recognize the right of every child to a standard of living adequate for the child's physical, mental, spiritual, moral and social development.



**American Academy of Environmental  
Medicine**

6505 E Central • Ste 296 • Wichita, KS 67206  
Tel: (316) 684-5500 • Fax: (316) 684-5709  
[www.aaemonline.org](http://www.aaemonline.org)

**Jan 2012 – Statement against Wi Fi in schools:**

- Adverse effects, such as learning disabilities, altered immune responses, headaches etc are well documented in scientific literature

**June 2012 – Board opposes the installation of wireless “smart” meters**

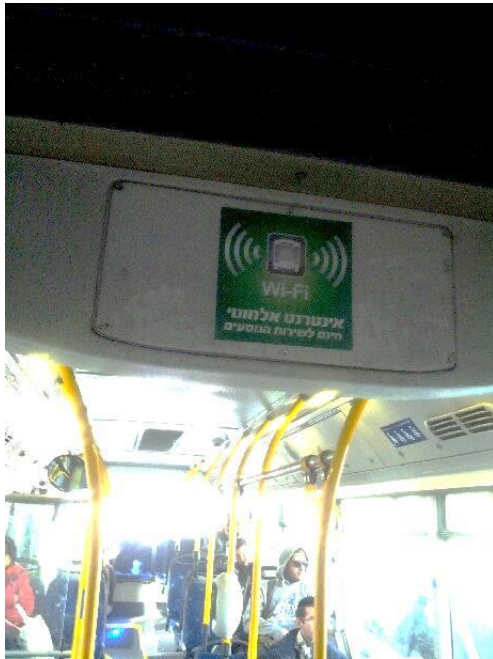
- A preventable environmental hazard

**“Patients are reporting to physicians the development of symptoms and adverse health effects after ‘Smart Meters’ are installed on their homes.**

**Immediate action is necessary to protect the public’s health.”**



# Public transport



Wi Fi  
in bus

+ everyone's cellphones  
& tablets



Wi Fi in aircraft



Wi Fi on the train

# ELF exposure in public transport

2004

*Biological Effects of EMFs, 3rd International Workshop, Kos, Greece 4-8 October, 2004, pp: 1065-1071.*

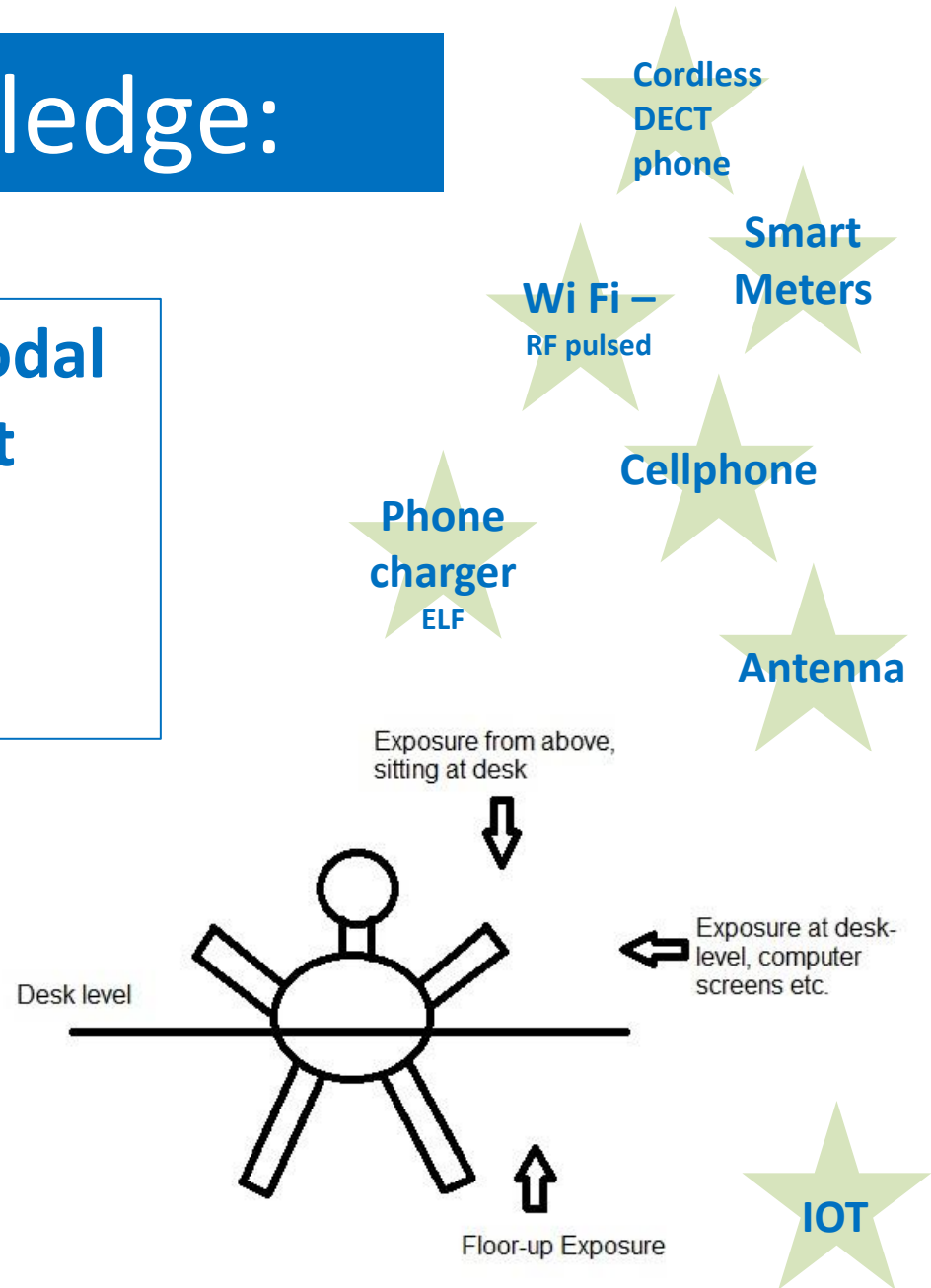
## **PASSENGER EXPOSURE TO MAGNETIC FIELDS ON GO- TRAINS AND ON BUSES, STREETCARS, AND SUBWAYS RUN BY THE TORONTO TRANSIT COMMISSION, TORONTO, CANADA**

MAGDA HAVAS, SIMON SHUM and RAHEMAN DHALLA  
ENVIRONMENTAL & RESOURCE STUDIES, TRENT UNIVERSITY

- **Commuters with electrical sensitivity may have difficulty using some forms of public transit**
- **Toronto** - as many as 2% of the 1.4 million daily revenue passengers may be electrically sensitive

# Gaps in knowledge:

- Cumulative multi-modal exposure assessment
- Long-term chronic exposures



# Gaps in protection



## Physicists / Engineers

Bio-physics

Dosimetry

Dielectric Spectroscopy

Penetration modelling



Who makes the decisions  
that affect Public Health?

## MD Physicians / Biologists / Epidemiologists

Epi → health effects → Lab studies / mechanisms

**"It is astonishing to see that the proponents of **thermal effects** of electromagnetic fields have learned nothing new over the last 40 years"**

**Prof. Dr. Karl Hecht**

- European and US exposure limits **STANDARDS** cannot claim to provide protection
- Short-term studies cannot discover harm
- Policies claim safety where a warning would be in order
- Affects the administration of justice
  - incorrect judgments are passed—court is forced to do so within currently valid legal framework

# Health Implications of Long-term Exposure to Electromog

Karl Hecht

Effects of Wireless Communication Technologies

A Brochure Series of the  
Competence Initiative for the Protection of  
Humanity, the Environment and Democracy e.V.

Brochure 6

**Brochure  
Series**

English edition of the German edition (2012), August 2016

### Reported Biological Effects from Radiofrequency Radiation at Low-Intensity Exposure (Cell Tower, Wi-Fi, Wireless Laptop and 'Smart' Meter RF Intensities)

Stress proteins, HSP, disrupted immune function

Reproduction/fertility effects

Oxidative damage/ROS/DNA damage/DNA repair failure

Disrupted calcium metabolism

Brain tumors and blood-brain barrier

Sleep, neuron firing rate, EEG, memory, learning, behavior

Cancer (other than brain), cell proliferation

Cardiac, heart muscle, blood-pressure, vascular effects

#### STANDARDS

0.08 W/Kg	IEEE Standard uncontrolled public environment (whole body)	IEEE
0.4 W/Kg	IEEE Standard controlled occupational environment (whole body)	IEEE
1.6 W/Kg	FCC (IEEE) SAR limit for 1 gram of tissue in a partial body exposure	FCC, 1996
2 W/Kg	ICNIRP SAR limit for 10 grams of tissue	ICNIRP, 1996



# Rediscovering...

Electromagn Biol Med. 2017;36(2):123-131. doi: 10.1080/15368378.2016.1194294. Epub 2016 Jul 15.

**Trigeminal neurons detect cellphone radiation: Thermal or nonthermal is not the question.**

Marino AA<sup>1</sup>, Kim PY<sup>1</sup>, Frilot li C<sup>2</sup>.

Trigeminal neurons were capable of detecting temperature changes far below skin temperature increases caused by cellphone radiation

Radiation standards for cellphones based on a thermal/nonthermal binary distinction do not prevent neurophysiological consequences of cellphone radiation

## Wi Fi in school



**Risks are uncertain**

- The discussion about deployment of networks in schools in Israel is not yet
- It should be remembered that most of the public, including children, are already using wireless networks in their homes and in the public
- It should also be taken into account that the use of a cellular phone exposes the user to a much higher intensity of electromagnetic radiation than the wireless network

# What is the formal recommendation of the Ministry of Env Protection?

Q by **Gideon Leichner**, parent activist

A by **Prof. Stelian Ghelberg**, Director of Noise and Radiation Prevention Department, Environmental Protection Min.

**Q: What is the problem and/or danger with Wi Fi in classes, when using 20 or more tablets/laptops?**

**A: Un-justified radiation exposure from the tablets/laptops' transmitters**

**Q: What is your position and recommendation for the Ministry of Education and/or to the local authorities regarding installing wired and/or wireless network in the schools?**

**A: To use a wired network.**

The local authority must explain why it is not installing a wired network.

**Q: What is the area of responsibility of the Environmental Protection Min regarding wireless (Wi Fi) radiation sources on school grounds?**

***A: The Ministry has no authority*** since **this equipment is exempt from getting permissions** as is stated in the Non-Ionizing Radiation Law 2006

**The difference between the maximum output and the average is much higher in case of Wi Fi networks**

**Q: Is a different test needed** in order to measure the strength of radiation in a classroom from cellular sources as opposed to Wi Fi sources?

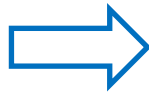
***A: This is currently being examined as part of a research project by a student at the Hadassah college***



## Municipalities

### Installing Wi Fi in schools & refusing wired networks

- According to directions from Min of Education
- **Justified by Min of Health website “Tnuda”**
- Performing radiation measurements authorized by Min of Env Protection



## Min of Env Protection

- Formal position is that first line should be wired networks because Wi Fi in class is **unjustified exposure**
- Requires schools to justify why a wired network is not installed?  
NOT DONE
- **Has NOT yet developed / approved guidelines for measurement of Wi Fi**
- Does not have the specific equipment to measure Wi Fi



## Ministry of Health

- Formal position: we're not experts on EMF, we have a counsellor → see her website “Tnuda”
- Counsellor (Sadetzki): **Risk is yet unclear.** Regarding technical issues, I am not an expert, I rely on the Min of Env Protection
- **“Tnuda” website continues to approve = Min of Health does not prohibit massive deployment of Wi Fi in schools all over Israel**

# Jerusalem Municipality Department of Education - “Manhi”:

*“My policy is whatever the Ministry of Health tells me to do”*

**“I shall never authorize wired internet in any Jerusalem school”**

***Why?***

**MOH’s “Tnuda” website says there is no problem with Wi Fi in schools**

*“...If you oppose wireless technology you should remove your child from this school.”*

# SUMMARY

## Exposure assessment:

- Cumulative multi source and multi modal exposures
- Long term exposures
- Thermal-only standards are outdated and non-protective

## Protection:

- Better coordination in policy is required
- A clearer message for protection

## Acknowledgements:



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University of Utah

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Dep of Environmental Science