ITU Regional Economic Dialogue on ICTs for Europe and CIS Region (RED-19)
30-31 October 2019; Odessa, Ukraine:
"Regulatory and Economic Tools for a Dynamic ICT Market Place"

Preparing for 5G:

Evolution of RF-EMF Compliance Standards and Regulations for Mobile Devices

Thomas Barmueller
Director EMEA, Mobile & Wireless Forum

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About the MWF

- The MWF is an international non-profit association of telecommunications equipment manufacturers with an interest in mobile or wireless communications.

www.mwfai.org

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5G: Promise and Challenge

- Meets the huge growth in data and connectivity*
  - Globally 5.7B subscribers and 7.9B subscriptions;
  - Smartphones account for more than 60 percent of all mobile phone subscriptions;
  - 1.9 billion 5G subscriptions by the end of 2024.
- Increased speed, responsiveness and capacity
- Key infrastructure for IoT and emerging technologies,
  - e.g. autonomous vehicles, smart manufacturing, virtual reality
- Conformity challenges to be addressed, e.g.
  - Beamforming and MIMO make RF exposure highly variable in time and space;
  - Compliance of multiple IoT systems.

* Ericsson Mobility Report, June 2019

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5G: Not Only Above 6GHz

- Below 6GHz - ”sub-6”
  - Operate in same way as existing networks.

- Above 24GHz - ”mmWaves”
  - Existing uses of mmWaves include:

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Research Relevant for 5G-Frequencies

- Below 6GHz (sub-6):
  - Research into EMF has been undertaken for 60+ years.
  - Existing research is extensive.
  - EMF-Portal*: 28,000 published scientific articles on the biological and health effects of EMF and 2,500 studies on mobile communications.
- Above 24GHz (mmWaves):
  - Recent review identified 470 studies @ mmWaves
  - Conclusions:
    - mmWaves are entirely absorbed in the epidermis and the dermis
    - Effects = thermal

*www.emf-portal.org

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Growing Body of Scientific Evidence

Source: www.emf-portal.org (status December 2017); lower number refers to 'mobile communications' studies, larger number to 'all topics' and 'all frequency ranges'

Overview of MWF Research Efforts

http://www.mwfai.org/docs/eng/2018_05_MWF_20YearsofResearch.p

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Biological Effects of Millimeter Waves[1]

What are mmWaves?

Millimeter (mm) waves comprise the region of the electromagnetic spectrum between 30 and 300 GHz.

How much is known about the biological effects of mmWaves?

More than 470 papers are identified by the authors[1].
A 1997[2] review covered about 50 peer-reviewed Western papers and about 300 published in the former Soviet Union[3]. This paper reviewed findings from an additional 124 papers published since 1997.

Existing usages of mmWaves

Speed Radars

Medical Treatment

Airport Screening

Accident Avoidance Systems

Mobile Communications

What areas have been studied?

Studies of mmWaves have already looked at the nervous and immune systems, gene expression, cell proliferation, effects on the eyes, skin heating and cancer. As was noted in an earlier paper, 'Importantly for medical applications, mmWaves do not possess sufficient photonic energy to break chemical bonds or cause ionization. Thus, they are incapable of producing chromosomal mutations and do not cause cancer[4]'.

What did the study conclude?

'mmWaves are entirely absorbed in the epidermis and the dermis'.

The only confirmed effects relate to heating – 'high intensity mmWaves can cause overheating of the skin'. This is the same as for the lower RF spectrum.

International RF exposure standards are designed to ensure temperature increases for both the public and workers remain well below these levels.

1 Biological effects of millimeter and submillimeter waves. Alekseev SI and Ziskin MC. in *Handbook of Biological Effects of Electromagnetic Fields* (B. Greenebaum and F. Barnes, editors), 4th ed., Chapter 6, pp. 179-242, 2019, CRC Press, Boca Raton, FL).

2 Pakhomov, A. G., Y. Akyel, O. N. Pakhomova, B. E. Stuck, and M. R. Murphy. 1998. Current state and implications of research on biological effects of millimeter waves: A review of the literature. Bioelectromagnetics 19:393–413.

3 According to the authors, the Soviet Union, China and other eastern European countries have used mmWaves for the treatment of more than 30 diseases.

4 Ziskin, MC. 2013, Review Millimeter Waves: Acoustic and Electromagnetic Bioelectromagnetics 34:3-14

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Publications

| Page 1 | Page 2 | Page 3 | Page 4 | Page 5 | Page 6 | Page 7 | .... | Page 15 |

MWF 5G Workshop: IEC 5G EMF Compliance Standards Development & EMF Exposure Assessment of Telstra's 5G Trial Network

July 2018 | Presentation

#1 Presentation by Mike Wood - Chairman IEC TC106 and Telstra Corporation, Melbourne, Australia at the MWF 5G Workshop held at the BioEM 2018 in June in Slovenia.

PDF

MWF 5G Workshop: EMF Standards for 5G Technologies

July 2018 | Presentation

#2 Presentation by Mike Wood - Chairman IEC TC106 and Telstra Corporation, Melbourne, Australia at the MWF 5G Workshop held at the BioEM 2018 in June in Slovenia

PDF

MWF 5G Workshop: EMF Exposure Limits above 6 GHz

July 2018 | Presentation

#3 Presentation by Prof. Akimasa Hirata, Nagoya Institute of Technology; Nagawa, Japan at the MWF 5G Workshop held at the BioEM 2018 in June in Slovenia.

CATEGORIES

All Categories
Audio
Brochure
Case Study
Presentation
Press Release
Research Update
Technical Paper
Video
Viewpoint

Which limits to apply:

Council Recommendation 1999/519/EC

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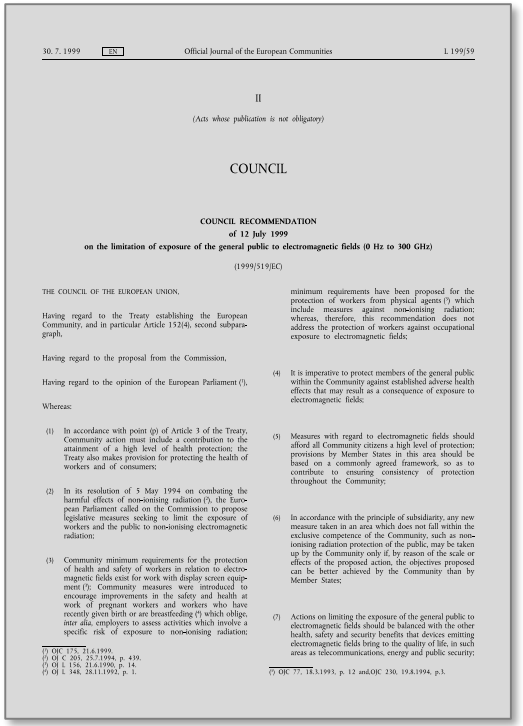
Council Recommendation 1999/519/EC



30. 7. 1999 EN Official Journal of the European Communities L 199/59

II

(Acts whose publication is not obligatory)

COUNCIL

COUNCIL RECOMMENDATION
of 12 July 1999
on the limitation of exposure of the general public to electromagnetic fields (0 Hz to 300 GHz)

(1999/519/EC)

THE COUNCIL OF THE EUROPEAN UNION,

Having regard to the Treaty establishing the European Community, and in particular Article 152(4), second subparagraph,

Having regard to the proposal from the Commission,

Having regard to the opinion of the European Parliament (1),

Whereas:

(1) In accordance with point (p) of Article 3 of the Treaty, Community action must include a contribution to the attainment of a high level of health protection; the Treaty also makes provision for protecting the health of workers and of consumers;

(2) In its resolution of 5 May 1994 on combating the harmful effects of non-ionising radiation (2), the European Parliament called on the Commission to propose legislative measures seeking to limit the exposure of workers and the public to non-ionising electromagnetic radiation;

(3) Community minimum requirements for the protection of health and safety of workers in relation to electromagnetic fields exist for work with display screen equipment (3). Community measures were introduced to encourage improvements in the safety and health at work of pregnant workers and workers who have recently given birth or are breastfeeding (4) which oblige, inter alia, employers to assess activities which involve a specific risk of exposure to non-ionising radiation; minimum requirements have been proposed for the protection of workers from physical agents (5) which include measures against non-ionising radiation; whereas, therefore, this recommendation does not address the protection of workers against occupational exposure to electromagnetic fields;

(4) It is imperative to protect members of the general public within the Community against established adverse health effects that may result as a consequence of exposure to electromagnetic fields;

(5) Measures with regard to electromagnetic fields should afford all Community citizens a high level of protection; provisions by Member States in this area should be based on a commonly agreed framework, so as to contribute to ensuring consistency of protection throughout the Community;

(6) In accordance with the principle of subsidiarity, any new measure taken in an area which does not fall within the exclusive competence of the Community, such as non-ionising radiation protection of the public, may be taken up by the Community only if, by reason of the scale or effects of the proposed action, the objectives proposed can be better achieved by the Community than by Member States;

(7) Actions on limiting the exposure of the general public to electromagnetic fields should be balanced with the other health, safety and security benefits that devices emitting electromagnetic fields bring to the quality of life, in such areas as telecommunications, energy and public security;

(1) OJC 175, 21.6.1999.
(2) OJ C 205, 25.7.1994, p. 439.
(3) OJ L 156, 21.6.1990, p. 14.
(4) OJ L 348, 28.11.1992, p. 1.
(5) OJC 77, 18.3.1993, p. 12 and OJC 230, 19.8.1994, p.3.

- Consilium **recommends implementing ICNIRP** exposure limits.
- **Most countries** in the world adhere to **ICNIRP**.
- **Adoption of ICNIRP** exposure limits is a **precautionary measure**.

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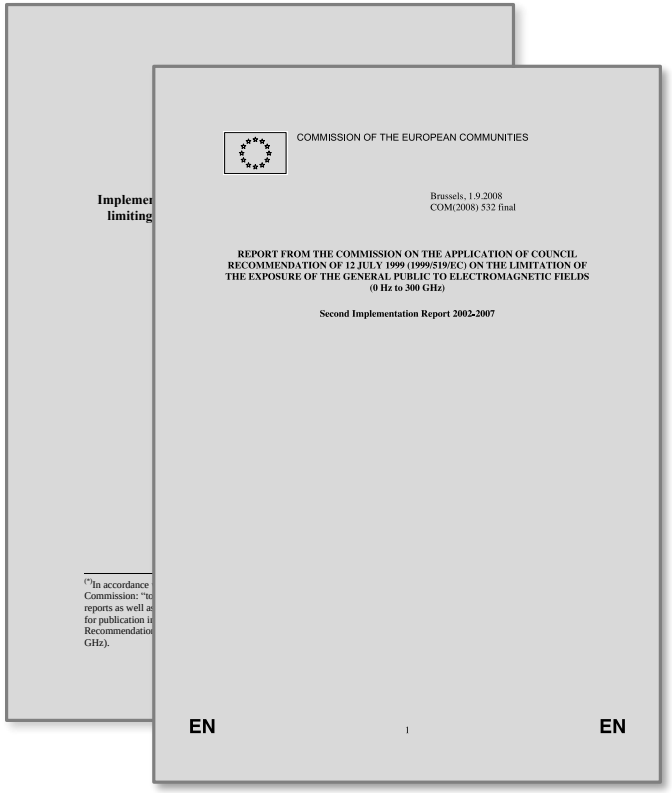
EC Reports on Implementation of ICNIRP Guidelines


COMMISSION OF THE EUROPEAN COMMUNITIES

Brussels, 1.9.2008
COM(2008) 532 final

REPORT FROM THE COMMISSION ON THE APPLICATION OF COUNCIL RECOMMENDATION OF 12 JULY 1999 (1999/519/EC) ON THE LIMITATION OF THE EXPOSURE OF THE GENERAL PUBLIC TO ELECTROMAGNETIC FIELDS (0 Hz to 300 GHz)

Second Implementation Report 2002-2007

EN 1 EN

- Implementation by Member States:
  - For devices: harmonised
  - For networks: diverse
- Differing exposure limits at the national level impact the roll-out of 5G.
- Digital Single Market requires level playing field – which should include exposure limits.

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ICNIRP, 1998:
Long Standing, Still Protective

- In 2017, ICNIRP issued a note on the Revision of the High-Frequency Portion of the ICNIRP 1998 EMF Guidelines

"ICNIRP therefore concluded … that **the 1998 guidelines still provide protection against all known health effects** of high-frequency radiation within the frequency range 100 kHz – 300 GHz."

https://www.icnirp.org/en/activities/news/news-article/revision-of-hf-guidelines-2017.html

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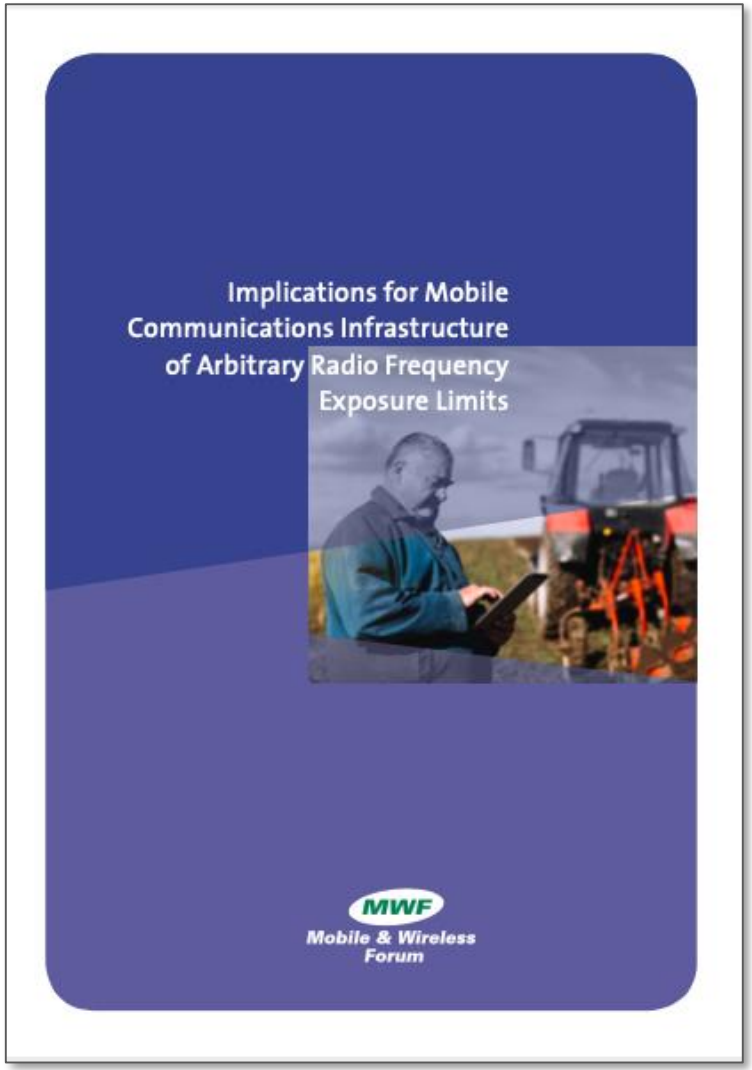

Arbitrary RF Exposure Limits: Practical Issues

- Large compliance distances
- Difficulties for co-location and site-sharing
- Impact for the provision of additional services via existing sites
- Reduced network coverage
- More antennas and more in-situ measurements needed
- Cost implications

http://www.mwfai.org/docs/eng/MWF%5FImplications%20of%20Lower%20RF%20Limits%5F2019%2Epdf

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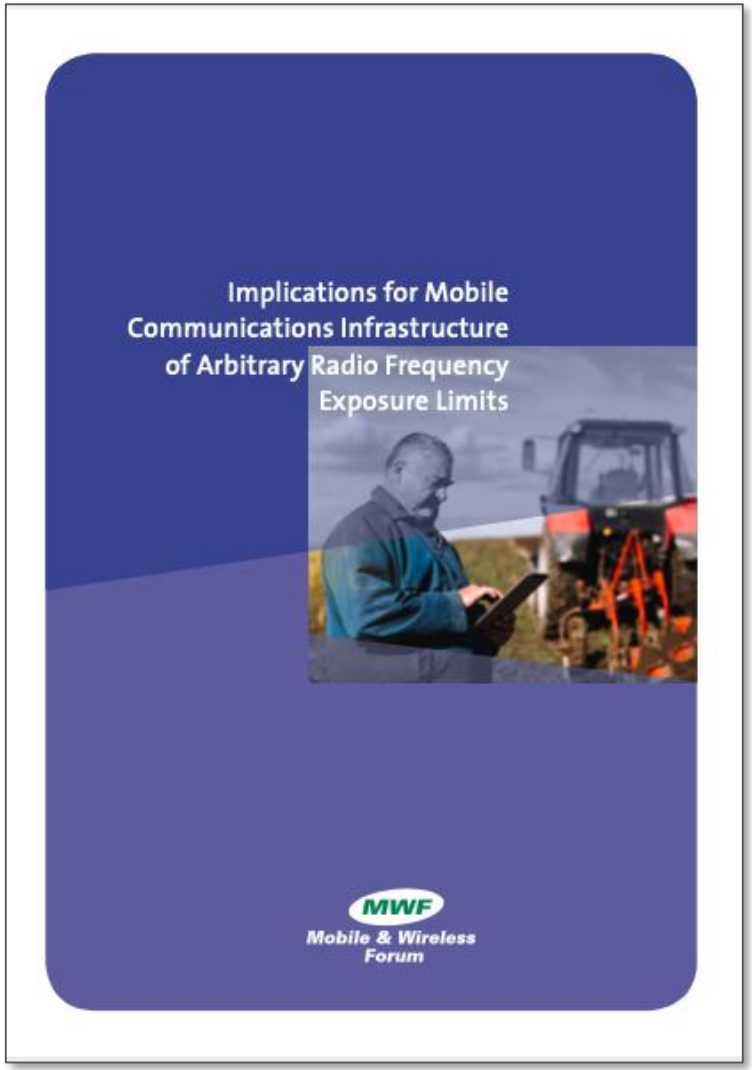

Arbitrary RF Exposure Limits: Political Issues

- No scientific rationale
- Increased public concern
- Reduced emergency services
- More base stations needed, more political discussions
- Exposure closer to the limits
- Economic and social benefits are ignored
- Overall policy environment of mobile communications

http://www.mwfai.org/docs/eng/MWF%5FImplications%20of%20Lower%20RF%20Limits%5F2019%2Epdf

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Specific Absorption Rate (SAR) Limit
and
Established Adverse Health Effect

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What's the Threshold?

Established biological and health effects in the frequency range from 10 MHz to a few GHz are consistent with **responses to a body temperature rise of more than 1°C.**

This level of temperature increase results from exposure of individuals under moderate environmental conditions to **whole-body SAR of approximately 4 W kg^{-1} for about 30 min**. A **whole-body average SAR of 0.4 W kg^{-1}** has therefore been chosen as the restriction that provides **adequate protection for occupational exposure**. An **additional safety factor of 5** is introduced for exposure of the **public**, giving an **average whole-body** is **SAR limit of 0.08 W kg^{-1}**.

ICNIRP Exposure Guideline 1998, doc page 16 / publication page 509

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ICNIRP SAR Limit: Mobile Phones

Exposure Characteristic	Whole Body averaged Specific Absorption Rate	Local SAR (10g; 6 minutes period)	
		Head & Trunk	Limbs (arms, legs)
Workers' exposure	0.4 W/kg	10 W/kg	20 W/kg
General Public exposure	0.08 W/kg	2 W/kg	4 W/kg

Guidelines for Limiting Exposure to Time-varying Electric, Magnetic and Electromagnetic Fields (up to 300 GHz)." Health Physics, April 1998, vol.74, number 4,

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WHO supports ICNIRP 1998 Limits for Mobile Phones

To date, **no adverse health effects** have been established as being **caused by mobile phone use**.

https://www.who.int/en/news-room/fact-sheets/detail/electromagnetic-fields-and-public-health-

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How to assess:

Compliance of Mobile Devices up to 6 GHz (SAR)

SAR - Specific Absorption Rate

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Mobile Phones: SAR Measurement

- IEC/EN 62209-1 Ed.2
  - **Measurement** procedure for the assessment of specific absorption rate of human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices - **Part 1: Devices used next to the ear (frequency range of 300 MHz to 6 GHz**)
- IEC/EN 62209-2:2010+AMD1:2019 CSV
  - Human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices - Human models, instrumentation, and procedures - **Part 2: Procedure to determine** the specific absorption rate (**SAR**) for wireless communication **devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz)**

Mobile Phones:
SAR Compliance Testing

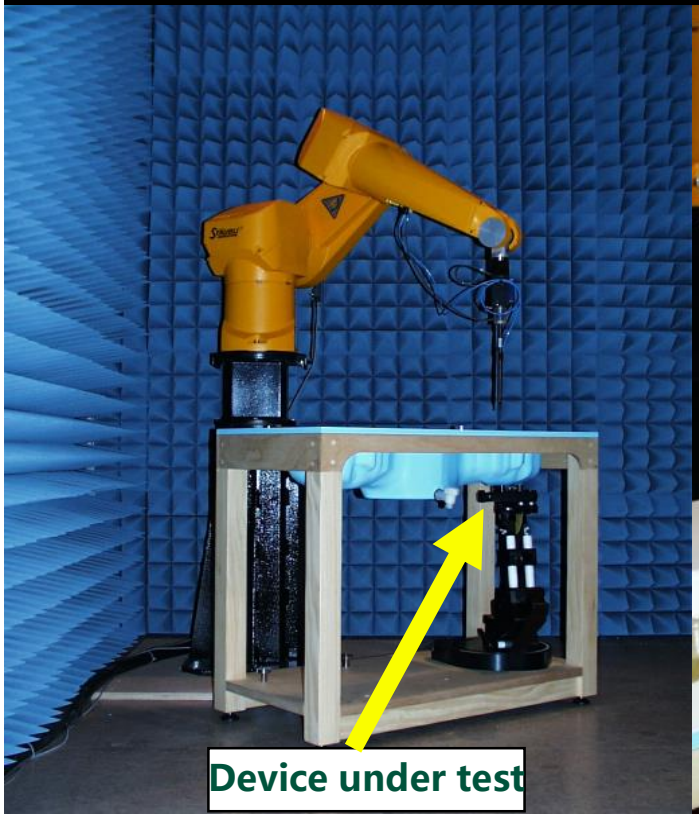
- Mobile phone compliance is **tested at highest power level** possible.
- Intended use position
  - next to the **ear**: **no separation distance** applies
    - EN 50360:2017
  - **body-worn**: separation **distance can apply**
    - EN 50566:2017, up to 5 mm
- Reasonably foreseeable conditions
  - Article 3(1)a in conjunction with Article 17(1) Radio Equipment Directive

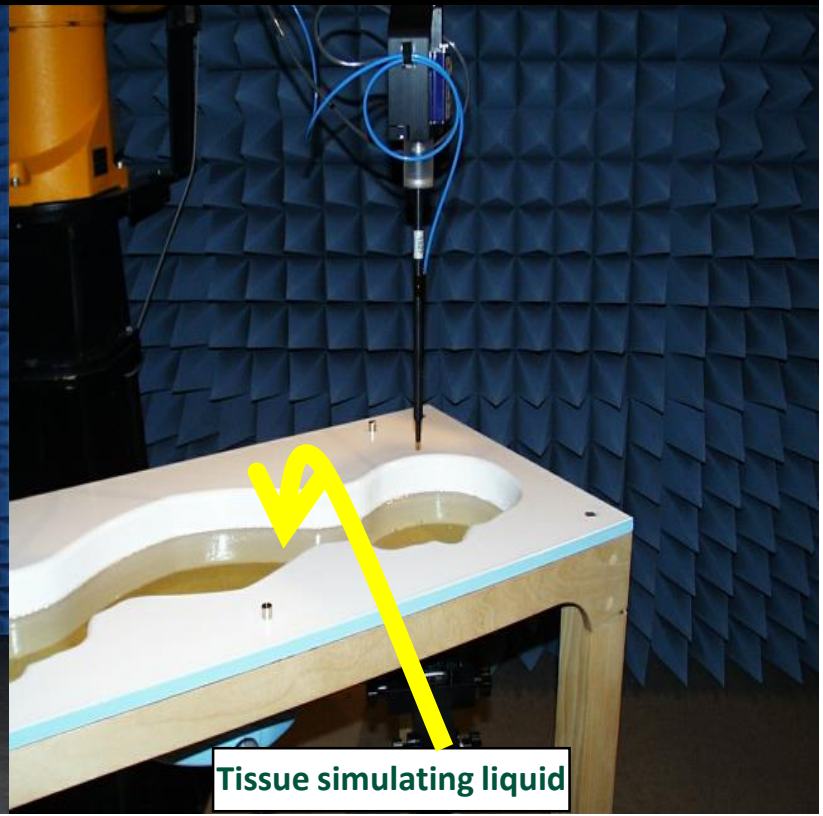
SAR Measurement - Next Level: IEC/IEEE 62209-1528*

- Methods for the assessment of electric, magnetic and electromagnetic fields associated with human exposure (4 MHz – 10 GHz)
- Fully harmonising SAR measurement (dual logo)
- **Specifies** protocols and test procedures for **SAR testing** with
  - **single or multiple transmitters,**
  - **proximity sensors,**
  - **time averaging,**
  - **fast SAR and test reduction,**
  - **uncertainty analysis**
- Representative for **entire population** including children
- Use of **hand-held or body-worn** wireless communication devices when used next to the **ear**, in front of the **face** or mounted on the **body**

*Current status: Final Draft International Standard; once adopted, it will supersede IEC 62209-1 (ear), 62209-2 (body) and IEEE 1528 (head

SAR Measurement Equipment





SAR measurement video: http://www.emfexplained.info/?ID=25593

How to assess:

EMF compliance challenges for devices > 6 GHz

SAR - Specific Absorption Rate

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EMF compliance challenges for devices > 6 GHz

- Change of exposure metric
- Assessment of incident power density in close proximity of a device
- Efficiency of compliance assessment methods

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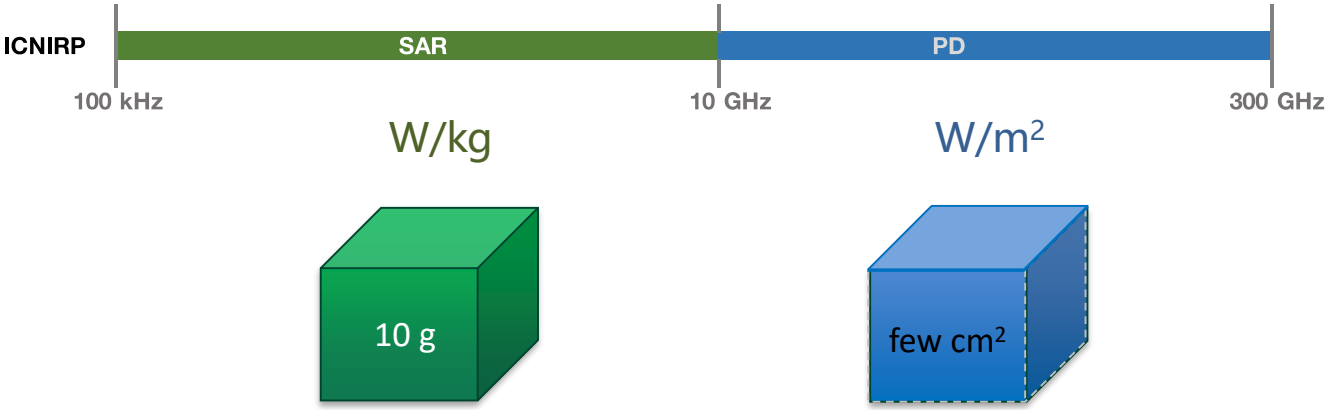
SAR & Power Density: Metric and Frequency



Status: October 2019 | SAR - Specific Absorption Rate | PD – Incident Power Density

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mmWaves: Incident Power Density

Numerically and experimentally assessed skin temperature elevations for localized RF exposure at frequencies above 6 GHz

D. Colombi[1], B. Xu[1], C. Törnevik[1], B. Thors[1], A. Christ[2], M. Ziskin[3], K. R. Foster[4] and Q. Balzano[5]
[1] Ericsson Research, [2] Research Consultant, [3] Temple University, [4] University of Pennsylvania, [5] University of Maryland

Objective: **Collect experimental data for skin temperature elevation due to RF exposure at frequencies above 6 GHz and compare with numerical results obtained by means of thermal modelling**
Results: (1) **State of the art thermal models can be used to conservatively predict skin temperature elevation due to RF energy absorption.** (2) **For the assessed configurations, the localized peak skin temperature elevation, corresponding to the exposure reference levels (ERL) recently proposed in the draft revision of IEEE C95.1, is less than 1 °C.**

Measurements

- Thermographic measurements based on IR recordings of the skin in close proximity to RF sources
- Frequencies investigated: 15 GHz, 28 GHz and 39 GHz (CW)
- Standard waveguide horn antennas (WR-62 and WR-28)
- FLIR A6750sc, cryo-cooled camera (sensitivity: < 20 mK)

IR camera
signal generator / power amplifier
directional coupler
antenna
power meter
absorber

Experimental peak steady-state skin temperature elevation, ΔT_{IEEE}
Subject 1
Subject 2
Subject 3
Temperature increase, °C
Forearm 28 GHz 5 mm
Forearm 28 GHz 15 mm
Forearm 39 GHz 5 mm
Forearm 39 GHz 15 mm
Forearm 15 GHz 5 mm
Forearm 15 GHz 15 mm
Forehead 28 GHz 5 mm
Forehead 28 GHz 15 mm
Forehead 39 GHz 5 mm
Forehead 39 GHz 15 mm
Forehead 15 GHz 5 mm
Forehead 15 GHz 15 mm
Trunk 28 GHz 5 mm
Trunk 28 GHz 15 mm
Trunk 39 GHz 5 mm
Trunk 39 GHz 15 mm
Trunk 15 GHz 5 mm
Trunk 15 GHz 15 mm

$$\Delta T_{IEEE} = \Delta T_{RAW} \frac{P_{IEEE}}{100\ mW}$$

P_{IEEE} = Max forward power to comply with IEEE/ICES draft general public ERLs ($55^{f^{0.177}}$ W/m^2 averaged over 4 cm^2, 6 GHz ≤ f ≤ 100 GHz)

100 mW = Forward power to the horn antenna

ΔT_{RAW} = Measured temperature increase for a forward power of 100 mW

ΔT_{IEEE} = Temperature increase for a forward power of P_{IEEE}

P_{IEEE} (based on power density measurements)

	15 GHz	28 GHz	39 GHz
5 mm	25 mW	16 mW	14 mW
15 mm	33 mW	24 mW	18 mW

Comparison with simulations

4-layer tissue model as described in:
Sasaki, et al. "Monte Carlo simulations of skin exposure to electromagnetic field from 10 GHz to 1 THz." Physics in Medicine & Biology 62.17 (2017): 6993.

epidermis
subcutaneous tissue
dermis
muscle

Forearm 28 GHz, 5 mm
Forearm 39 GHz, 5 mm
Numerical
Experimental: Subject 1
Experimental: Subject 2
Experimental: Subject 3
Time, s

	Thickn.	Thermal Properties: Thermal cond.	Heat cap.	Blood perf.	Meta. rate
	mm	W/K/m	kJ/K/kg	W/K/m³	W/m³
epidermis	0.102	0.42	3.5	0	1620
dermis	1.08	0.42	3.5	9100	1620
subcutaneous tissue	3.89	0.25	2.5	1700	300
muscle	23.3	0.5	3.6	2700	480

Additional results and future work

- IR measurements of a mockup device (characterized by a notch array at 28 GHz, see IEC TR 63170) were also conducted; the measured peak skin temperature increase at touch position with the forearm was less than 1°C for a forward power of 75 mW
- Thermographic measurement samples with clothing (wool jumper) showed similar or lower skin temperature increase compared with bare skin
- The skin temperature increase due to a lightbulb (20 W, halogen) placed at 20 cm from the forearm was 4.5° C after 7 minutes
- The surface skin temperature variation for the forearm when not exposed to any RF source, was found to be within 4 °C to 5 °C
- Additional numerical evaluations are needed in order to quantify the impact of the layering structure of skin tissue and the uncertainty of the thermal tissue parameters

- **At mmW frequencies, incident power density** can be **used to limit tissue temperature elevation** from near-field RF sources.

Source:
http://www.mwfai.org/docs/eng/Numerically%20and%20experimentally%20assessed%20skin%20temperature%20for%20RF%20exposures%20above%206%20GHz%2Epdf

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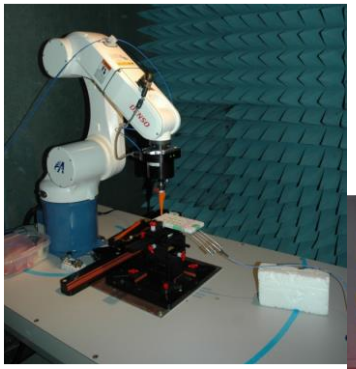
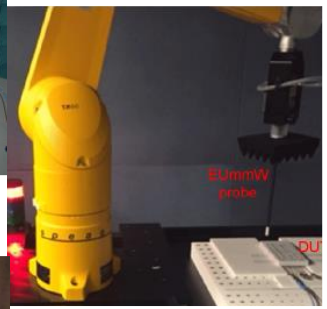
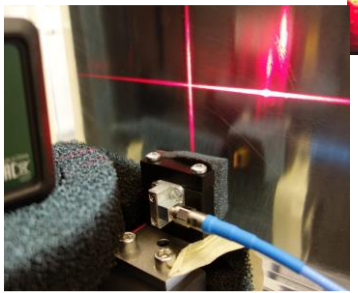
Assessment of Incident Power Density in close proximity of a device

- Different methods available (IEC Technical Report 63170), e.g.:
  - Measurement of both electric and magnetic fields **on** the evaluation surface
  - Measurement of the amplitude of the electric fields **on** the evaluation surface (phase reconstruction)
  - Measurement of the electric fields (amplitude and phase) **at a larger distance** of the evaluation surface (field back-projection)







Photos: TR 63170

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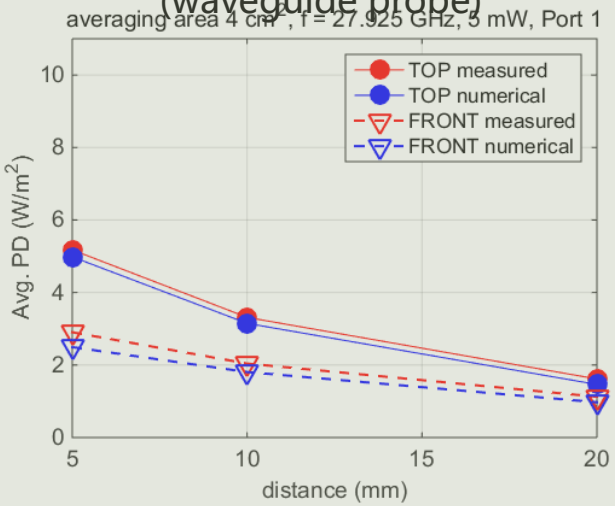
Assessment of Incident Power Density: Use Case, TR 63170

Measurement of the **E-field (amplitude and phase)** at a larger distance from the evaluation surface (waveguide probe)



(SONY mockup, notch antenna array, 28GHz)

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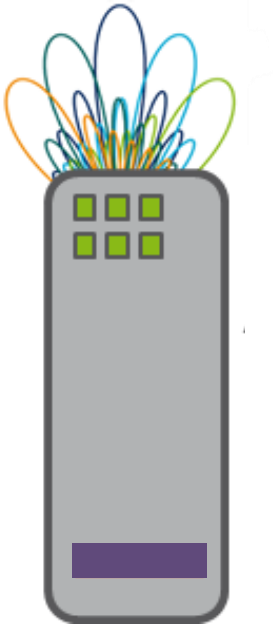
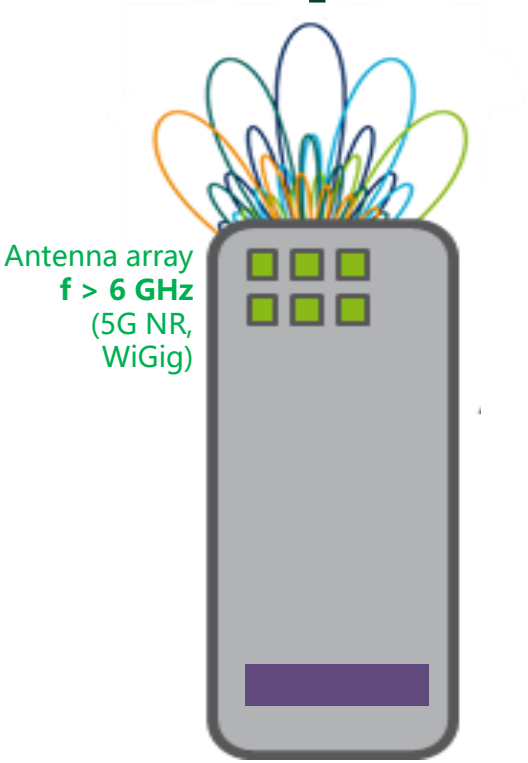
Efficiency of compliance assessment methods



http://emfhealth.info/docs/eng/8%5FChallenges%20in%20standardization%20related%20to%20EMF%20compliance%20above%206%20GHz%2

Efficiency of compliance assessment methods



- Measurements are extremely **time-consuming**.
- Multiple transmitters **below and above 6 GHz**
  - Antenna arrays require **combination of fields**
  - **Total exposure ratio** includes contributions from below and above 6 GHz
- Compliance tests for 5G devices require a large number of field combinations and configurations.
- **Need to combine numerical methods and measurements.**

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How to assess:

Compliance of Mobile Devices above 6 GHz (Incident Power Density)

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Mobile Devices: Incident Power Density (1)

- IEC Technical Report 63170:2018
  - **Measurement** procedure for the evaluation of **power density** related to human exposure to radio frequency fields from wireless communication devices operating between **6 GHz and 100 GHz**
    - Published in 2018
- Content:
  - State of the art **measurement techniques and test approaches** for evaluation of local and spatial-average incident power density in close proximity to the user
  - **Guidance for testing** portable devices in applicable operating position(s) **near the human body** (methods may also apply to exposures in close proximity to base stations)
  - How to assess **exposure from multiple simultaneous transmitters** operating **below and above 6 GHz, including combined exposure of SAR and power density**

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Mobile Devices: Incident Power Density (2)

- IEC / IEEE 63195 Ed1
  - **Measurement** procedure for the assessment of **power density** of human exposure to radio frequency fields from wireless devices operating in close proximity to the head and body – Frequency range of **6 GHz to 300 GHz**
    - Publication expected in early 2021
- IEC / IEEE 62704-5 Ed1
  - Determining the power density of the electromagnetic field associated with human exposure to wireless devices operating in close proximity to the head and body **using computational techniques**, **6 GHz to 300 GHz**
    - Publication expected in early 2021
    - most likely published as 'IEC / IEEE 63195 – part 2'

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Mobile Devices: Incident Power Density (3)

- IEC/IEEE 63195 and IEC/IEEE 62704-5 are inter-dependant.
  - Measurement standard 63195 to validate simulations.
  - Simulation standard 62704 to define conservative cases for measurements.

- Power density compliance assessment requires simulations.
  - Many antennas involved, antenna array, beam forming and steering options, assessing devices that use frequencies below and above 6 GHz, including combined assessment of SAR and PD

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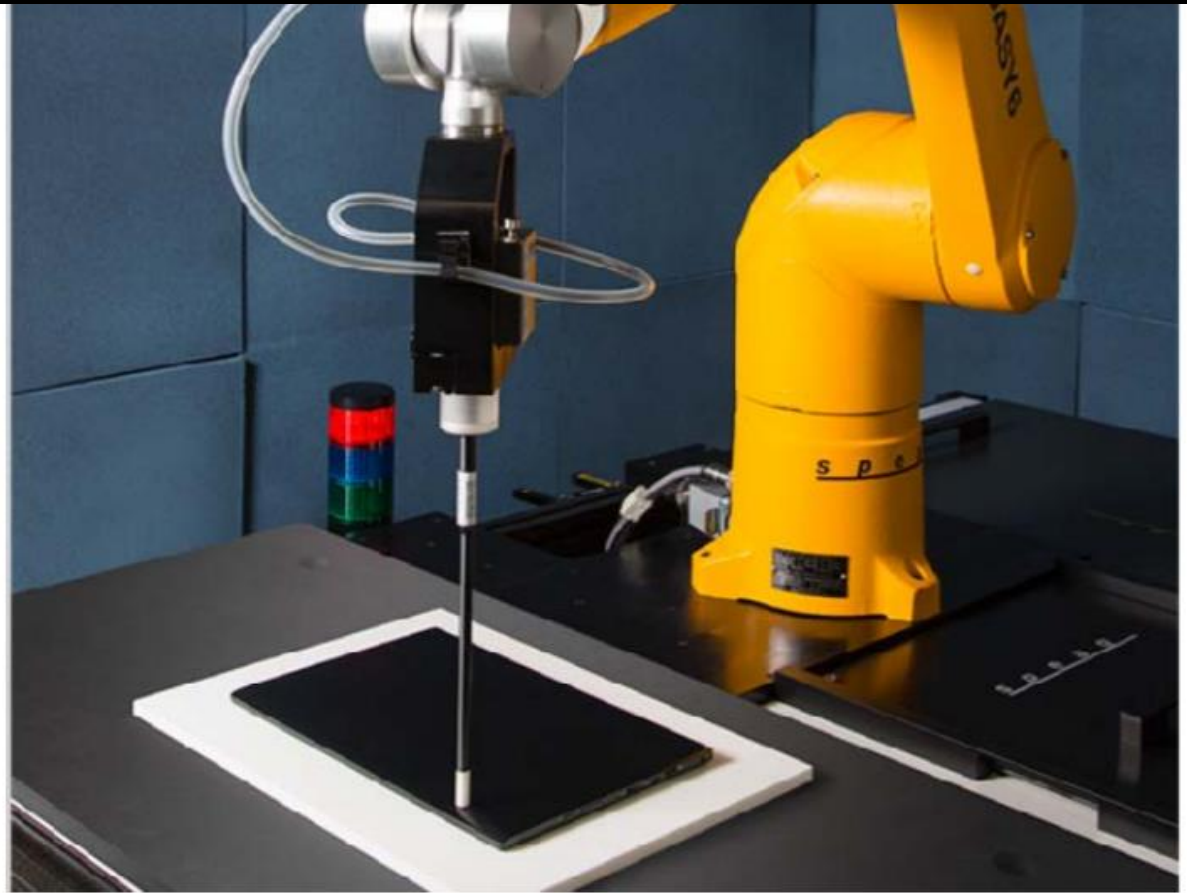
PD Measurement Equipment



How to regulate:

Update Regulations to Cover New Developments

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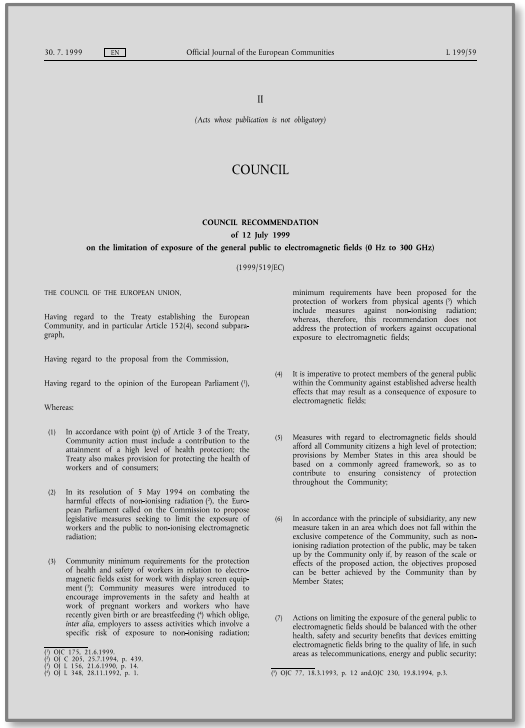
Council Recommendation 1999/519/EC



30. 7. 1999 EN Official Journal of the European Communities L 199/59

II

(Acts whose publication is not obligatory)

COUNCIL

COUNCIL RECOMMENDATION
of 12 July 1999
on the limitation of exposure of the general public to electromagnetic fields (0 Hz to 300 GHz)

(1999/519/EC)

THE COUNCIL OF THE EUROPEAN UNION,

Having regard to the Treaty establishing the European Community, and in particular Article 152(4), second subparagraph,

Having regard to the proposal from the Commission,

Having regard to the opinion of the European Parliament (1),

Whereas:

(1) In accordance with point (p) of Article 3 of the Treaty, Community action must include a contribution to the attainment of a high level of health protection; the Treaty also makes provision for protecting the health of workers and of consumers;

(2) In its resolution of 5 May 1994 on combating the harmful effects of non-ionising radiation (2), the European Parliament called on the Commission to propose legislative measures seeking to limit the exposure of workers and the public to non-ionising electromagnetic radiation;

(3) Community minimum requirements for the protection of health and safety of workers in relation to electromagnetic fields exist for work with display screen equipment (3). Community measures were introduced to encourage improvements in the safety and health at work of pregnant workers and workers who have recently given birth or are breastfeeding (4) which oblige, inter alia, employers to assess activities which involve a specific risk of exposure to non-ionising radiation; minimum requirements have been proposed for the protection of workers from physical agents (5) which include measures against non-ionising radiation; whereas, therefore, this recommendation does not address the protection of workers against occupational exposure to electromagnetic fields;

(4) It is imperative to protect members of the general public within the Community against established adverse health effects that may result as a consequence of exposure to electromagnetic fields;

(5) Measures with regard to electromagnetic fields should afford all Community citizens a high level of protection; provisions by Member States in this area should be based on a commonly agreed framework, so as to contribute to ensuring consistency of protection throughout the Community;

(6) In accordance with the principle of subsidiarity, any new measure taken in an area which does not fall within the exclusive competence of the Community, such as non-ionising radiation protection of the public, may be taken up by the Community only if, by reason of the scale or effects of the proposed action, the objectives proposed can be better achieved by the Community than by Member States;

(7) Actions on limiting the exposure of the general public to electromagnetic fields should be balanced with the other health, safety and security benefits that devices emitting electromagnetic fields bring to the quality of life, in such areas as telecommunications, energy and public security;

(1) OJC 175, 21.6.1999.
(2) OJ C 205, 25.7.1994, p. 439.
(3) OJ L 156, 21.6.1990, p. 14.
(4) OJ L 348, 28.11.1992, p. 1.
(5) OJC 77, 18.3.1993, p. 12 and OJC 230, 19.8.1994, p.3.

- Calls for
  - Relying on ICNIRP as endorsed by scientific committees of the EC;
  - Taking note of progress in scientific knowledge and technology;
  - Balancing EMF limits with other health, safety and security benefits.

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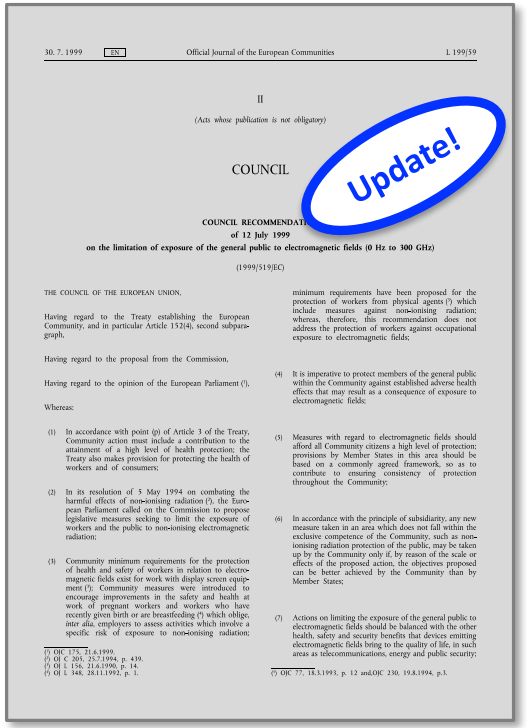
Update Council Recommendation



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Update!

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- Base update on new ICNIRP guidelines
- Consider progress in scientific knowledge
- Promote international consensus:

  Digital Single Market requires level playing field.

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How to create trust:

Transparency and Compliance Reporting

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MWF Recommendation on 'SAR Reporting'

- 2001 – 2010: Phase 1
  - SAR value in user manuals and on dedicated websites
- 2011 – 2019: Phase 2
  - SAR-Tick website
  - Mobile phone user manual:
    - Additional note on SAR in the front part of the user manual
    - Extended text with Head-SAR and Body-SAR details
    - World Health Organisation advice for concerned users
- 2020 onwards: Phase 3
  - User manual with additional note on Power Density (PD)

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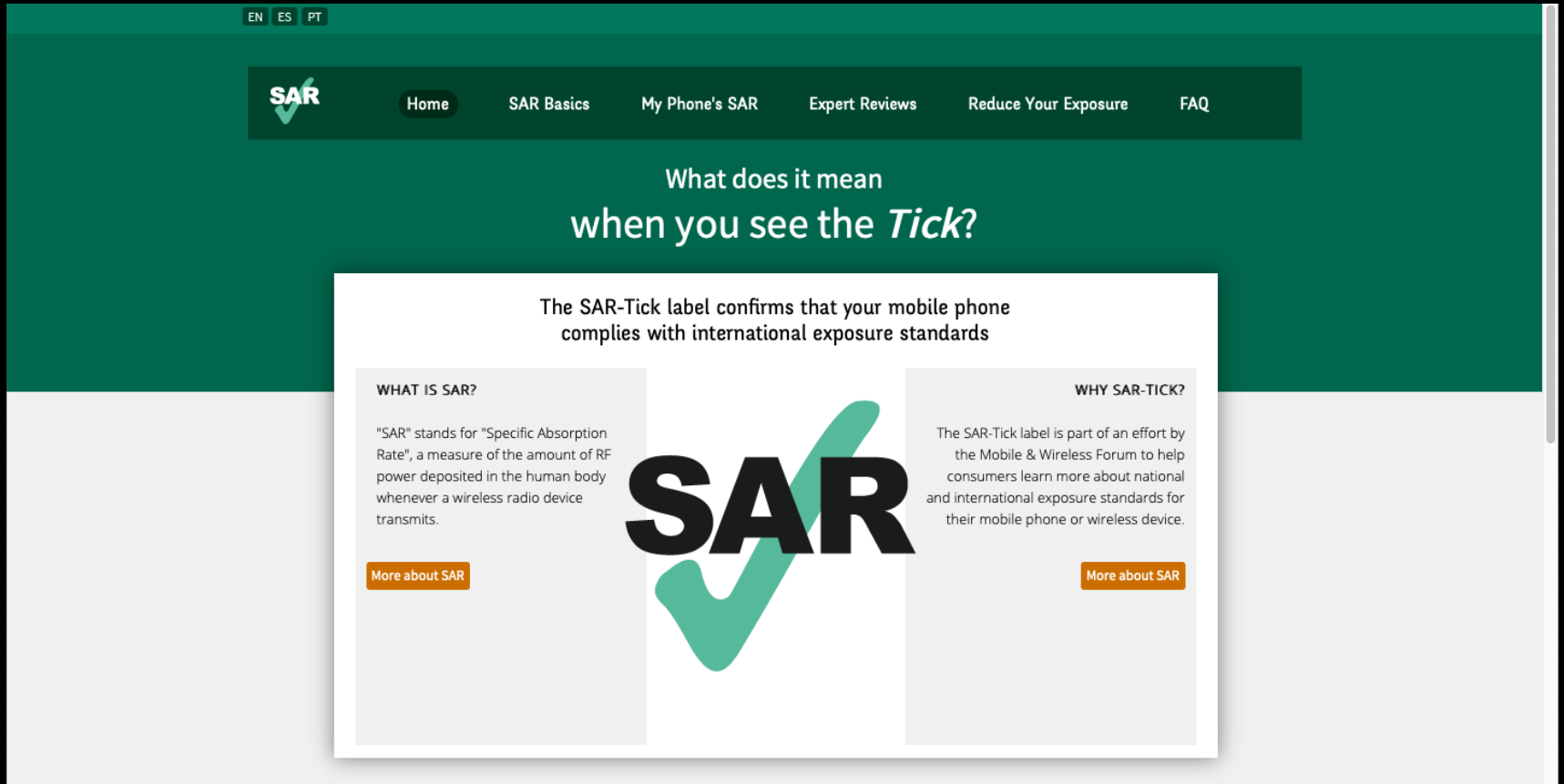
SAR-Tick.com


EN ES PT
SAR
Home
SAR Basics
My Phone's SAR
Expert Reviews
Reduce Your Exposure
FAQ
What does it mean
when you see the *Tick*?
The SAR-Tick label confirms that your mobile phone complies with international exposure standards
WHAT IS SAR?
"SAR" stands for "Specific Absorption Rate", a measure of the amount of RF power deposited in the human body whenever a wireless radio device transmits.
More about SAR
SAR
WHY SAR-TICK?
The SAR-Tick label is part of an effort by the Mobile & Wireless Forum to help consumers learn more about national and international exposure standards for their mobile phone or wireless device.
More about SAR

Thomas Barmüller

Thank you

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thomas.barmueller@mwfai.org | www.mwfai.org

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