Session on modern policies, guidelines, regulations and assessments of human exposure to RF-EMF

Geneva; ITU; 10 October 2018, 14:30 – 17:30

ITU recent activities (including Q7/2 report) on EMF

Dr. Haim Mazar (Madjar) h.mazar@atdi.com;
ITU D/R/T: RF-EMF, intersector activities.
ITU-D Study Group 2, Co-Rapporteur Q 7/2 on EMF

Intersector Activities

- Comments to the new ICNIRP guidelines on “Guidelines for limiting exposure to time-varying electric, magnetic and electromagnetic fields, (100 kHz TO 300 GHz)”. In cooperation with ITU-R and ITU-D experts, and based on the received Contribution from ATDI and Orange Polska and also from the inputs received during the ITU-T SG5 meeting, 32 comments have been included and sent to ICNIRP; see TD696-R1 and ICNIRP main Revisions, presentation of Dr. Rongen, Chair ICNIRP
- Mapping of ITU-D/R/T EMF activities to avoid overlap, mainly:
  - D: **Strategies** & **Policies** concerning human exposure to EMF
  - R: EMF **measurements** from **base stations** to assess human exposure
  - T: **Simulation**, assessment, **5G**

ITU-T

Standardization Sector

More information on EMF at the Sept. 2018 meeting report of Q3/5; see TD583-R2

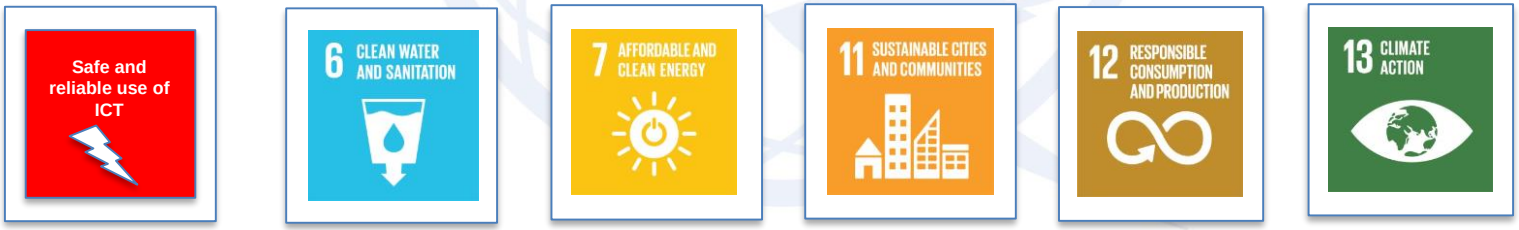
ITU-T Study Group 5: Environment, climate change and circular economy

SG5 is responsible for:
Studying ICT environmental aspects of electromagnetic phenomena and climate change.

Studies on how to use ICTs to help countries and the ICT sector to adapt to the effects of environmental challenges, including climate change, in line with the Sustainable Development Goals (SDGs).

Lead Study Group for

- electromagnetic compatibility, lightning protection and electromagnetic effects
- ICTs related to the environment, climate change, energy efficiency and clean energy
- circular economy, including e-waste



9 Questions

4 Regional Groups

Q3/5 – Human exposure to electromagnetic fields (EMFs) from information and communication technologies (ICTs)

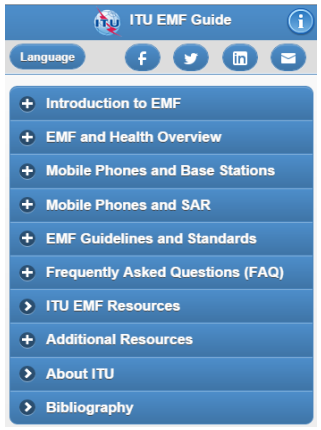
ITU-T Raising awareness on EMF

Key elements for successful public communications:

- Information easy to understand;
- Open and transparent dialogues;
- Providing stakeholders with trusted sources of information.

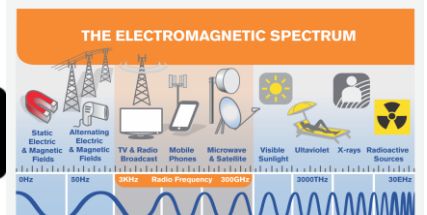
ITU's Public information on EMF:

- ITU EMF Guide – key information source
- EMF Website
- Report on "Monitoring of electromagnetic field levels in Latin America"
- Best practices to reduce exposure from mobile devices



The EMF Guide mobile app in the 6 UN official languages is available online at http://emfguide.itu.int. It is also available in Malay.

iOS BlackBerry App World ANDROID APP ON Google play

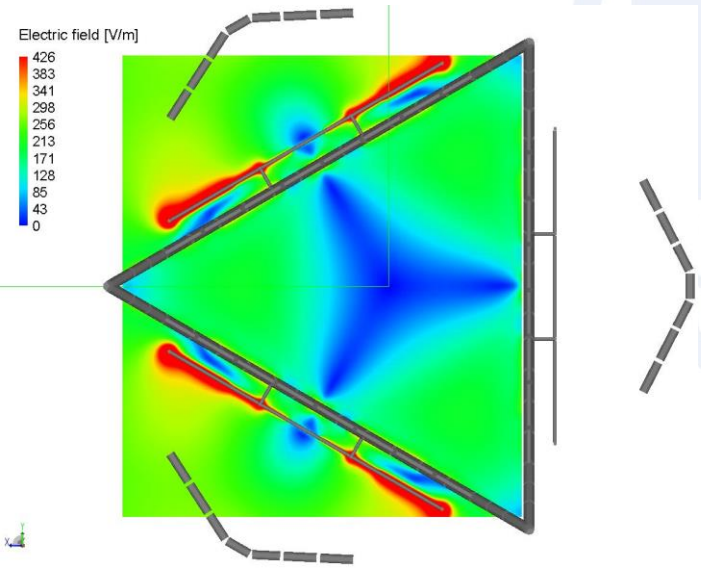


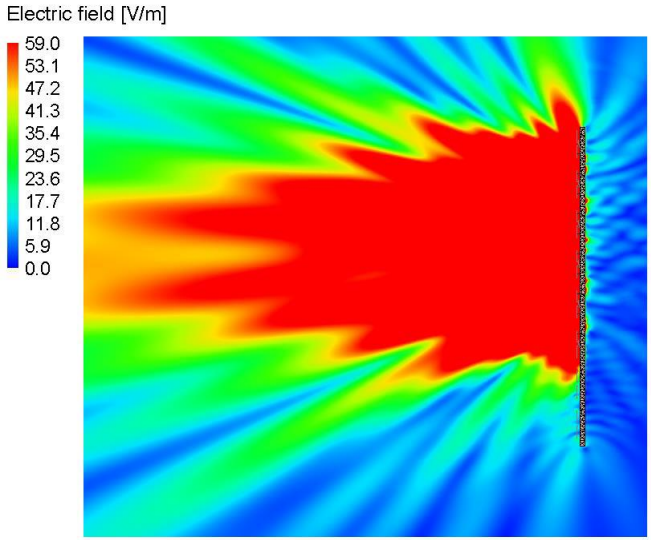
ITU-T Recommendations on EMF assessment

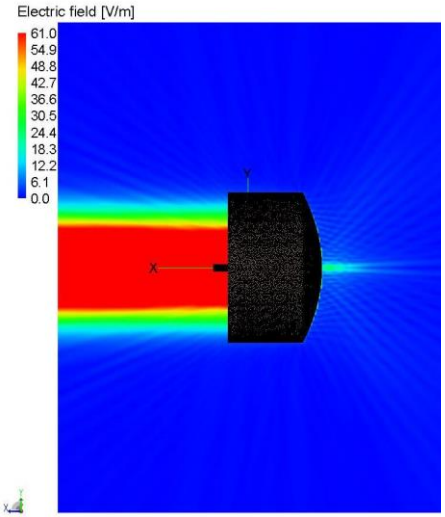
- **Recommendation ITU-T K.52** (2000/2014/2018) - Guidance on complying with limits for human exposure to electromagnetic fields – **includes „K.52calculator software"**
- **Recommendation ITU-T K.61** (2003/2018) - Guidance on measurement and numerical prediction of electromagnetic fields for compliance with human exposure limits for telecommunication installations
- **Recommendation ITU-T K.70** (2007/2018) - Mitigation techniques to limit human exposure to EMFs in the vicinity of radiocommunication stations – **includes „EMF Estimator software"**
- **Recommendation ITU-T K.83** (2011/2014) - Monitoring of electromagnetic field levels
- **Recommendation ITU-T K.90** (2012/2017) - Evaluation techniques and working procedures for compliance with exposure limits of network operator personnel to power-frequency electromagnetic fields– **includes „EMFACDC" software**
- **Recommendation ITU-T K.91** (2012/2017) - Guidance for assessment, evaluation and monitoring of human exposure to radio frequency electromagnetic fields – **includes "Uncertainty calculator" and "Watt_Guard" software, Supplement and mobile App "EMF-guide", mobile App „EMF Exposure"**
- **Recommendation ITU-T K.100** (2014/2017) - Measurement of RF EMF to determine compliance with human exposure limits when a base station is put into service
- **Recommendation ITU-T K.113** (2015) - Generation of RF EMF level maps

ITU-T Recommendations on EMF assessment

- **Recommendation ITU-T K.121** (2018) – Guidance on the environmental management for compliance with radio frequency EMF limits for radiocommunication base stations
- **Recommendation ITU-T K.122** (2016) - Exposure levels in close proximity of radiocommunication antennas







New ITU-T Supplements on EMF; Sept 2018/ May 2018

K.Suppl.16 to ITU-T K.series (ex.K.Supp-5G_EMF_Compliance): “EMF compliance assessments for 5G wireless networks” see document TD723

Supplement 4 to ITU-T K.91 on “EMF considerations in smart sustainable cities” see TD724-R1

New version of software EMF-estimator (Appendix I to K.70) and software K.52-calculator; see TD721 & TD722

new App VIII “Manhole BS” & App IX “EMF monitoring & info platform” see TD725 & TD727-R1

- **Supplement ITU-T K.Suppl.13** on RF-EMF exposure levels from mobile and portable devices during different conditions of use
- **Supplement ITU-T K.Suppl.14** on impact of RF-EMF exposure limits stricter than the ICNIRP or IEEE guidelines on 4G and 5G mobile network deployment

New Work Items on Human Exposure to EMF from ICTs

(WP1/5 meeting, 21-25 May 2018)

6 New work items agreed:

- Draft Recommendation ITU-T K.Zones - "Guidance on Determining the Compliance Boundaries (the exclusion zone) of a Live Antenna"
- Draft Recommendation ITU-T K.Small - "Small base stations - impact on the overall exposure level"
- Draft Recommendation ITU-T K.reflection - "Impact of the metallic structures for the EMF exposure level"
- Draft Recommendation ITU-T K.peak - "Comparison between peak and real exposure in the long term considerations"
- Draft Recommendation ITU-T K.5G_EMF_Dosimeter – "Assessment and management of compliance with RF EMF exposure limits for workers at radiocommunication sites"
- Draft Supplement ITU-T K.Suppl-Harmonization: "The impact of RF-EMF exposure limits stricter than the ICNIRP or IEEE guidelines on 4G and 5G mobile network deployment"

Geneva, 11-21 September 2018

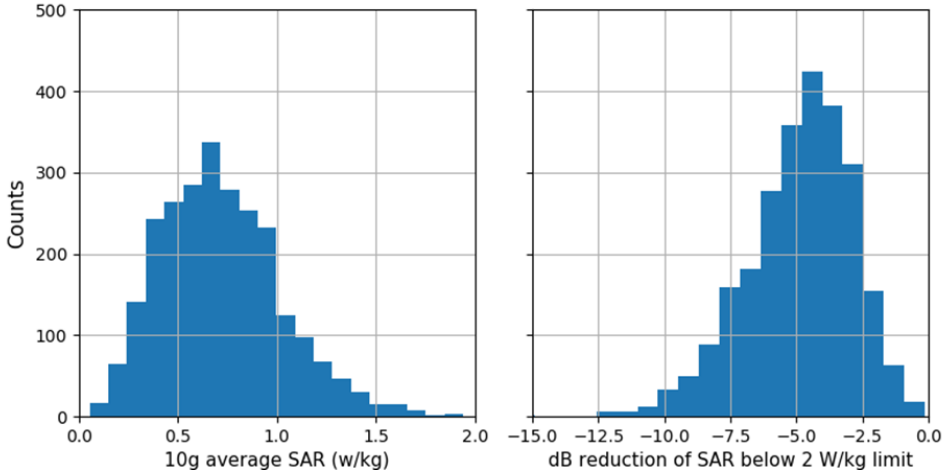
New Work Item K.dosimeter was revised in order to cover workers' safety in RF sites; see TD718.

The acronym and title have changed into: K.workers - Assessment and management of compliance with RF EMF exposure limits for workers at radiocommunication sites

Supplement ITU-T K.Suppl.13 on RF-EMF exposure levels from mobile and portable devices during different conditions of use

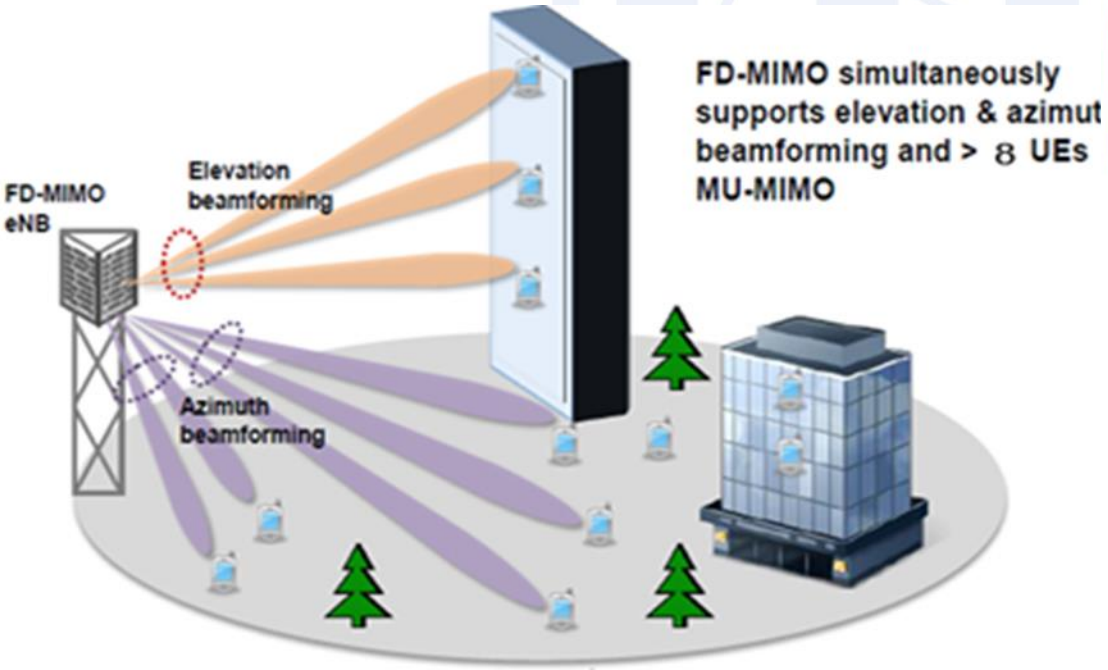
ITU-T K.Suppl.13 describes the various factors that determine the level of RF-EMF exposure, as defined by the specific absorption rate (SAR) that is induced in the users of mobile and portable radiocommunication devices. Based on this technical information practical information and guidance is provided for users of mobile devices. This Supplement presents:

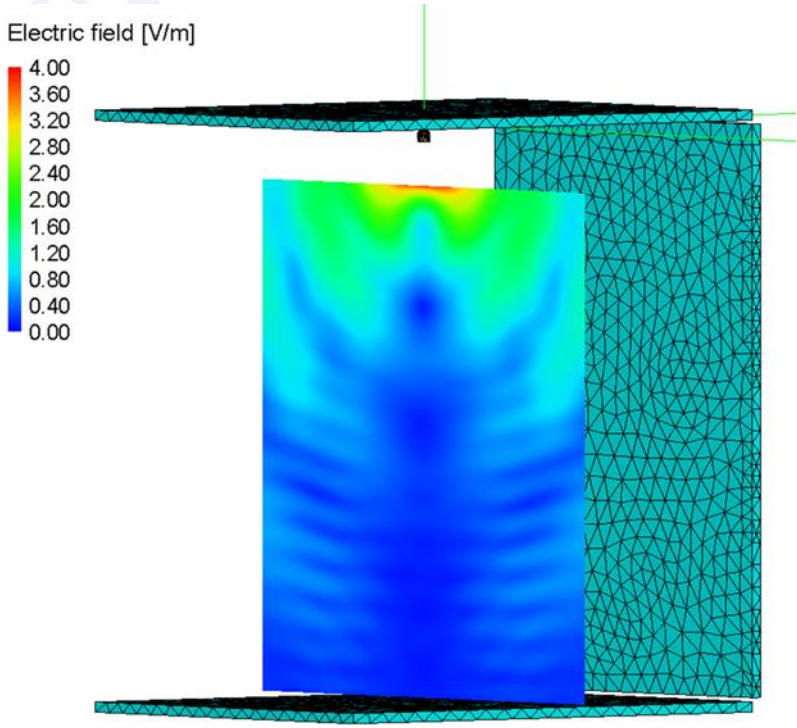
- Best practices presented in a way understandable for the general public;
- Best practices presented with scientific justifications.



K Suppl. 9 (11/2017)
5G technology and human exposure to RF EMF

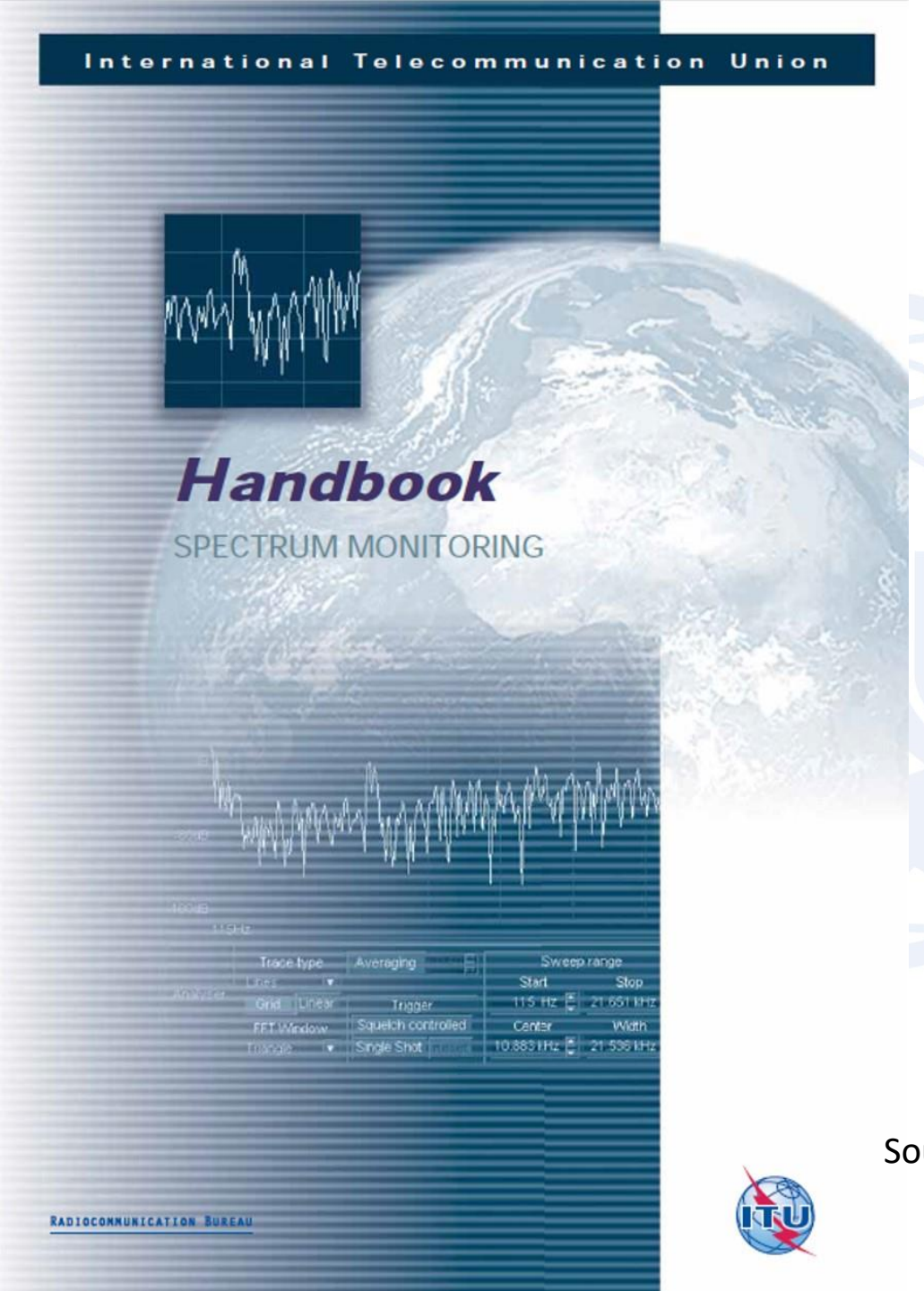
- Higher frequencies and higher throughput
- Shared infrastructure
- Smart antennas
- Small cells
- Internet of things (IoT), M2M





ITU-R

Radiocommunication Sector



ITU's worldwide recognized reference on Spectrum Monitoring and related issues

- Chapter 5.6 on **Non-Ionizing Radiation (NIR) measurements**
  - Explains **NIR limits & exposure quotient**
  - **Instruments for NIR measurements**
    - Broadband isotropic probes and meters
    - Tri-axis antennas and field strength meters
    - Transportable station
    - standard field strength measurement equipment
  - **Measurement procedures** for different radio services (incl. mobile, broadcasting, etc.)
  - **Reporting methods**

Source: ITU-R Handbook on Spectrum Monitoring
www.itu.int/pub/R-HDB-23

On-going ITU-R Studies on EMF measurements to assess human exposure

- Work initiated by the ITU Experts Group on Spectrum Monitoring (i.e. ITU-R WP 1C) in response to Question ITU-R 239/1 (2016):
- https://www.itu.int/dms_ties/itu-r/md/15/wp1c/c/R15-WP1C-C-0169!N09!MSW-E.docx

1. What are the **measurements techniques** to assess the human exposure from wireless installations of all types?
2. How can **measurement results** be presented?

- Significant progress made in 2017-2018
- Studies to be completed by 2019!

Source: Question ITU-R 239-1 - www.itu.int/pub/R-QUE-SG01.239

- Work by correspondence and at the next ITU-R WP 1C meeting planned on 28 May - 5 June 2019

Information from the preliminary draft new ITU-R Report* on EMF measurements to assess human exposure

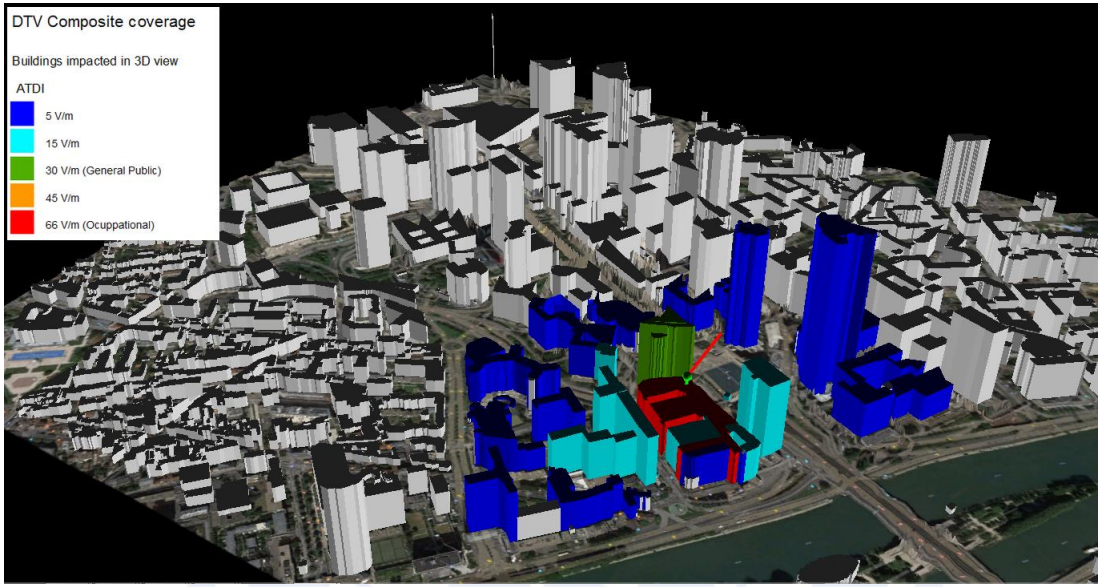
ICNIRP 1998 reference levels for occupational and general public exposure

Frequency range	Electric field-strength (V/m) *f*: frequency		Equivalent plane wave power-density S_{eq} (W/m^2)	
	general public	occupational	general public	Occupational
1-25 Hz	10 000	20 000	No Data on Power-Density	
0.025-0.82 kHz	250/*f*(kHz)	500/*f*(kHz)		
0.82-3 kHz	250/*f*(kHz)	610		
3-1 000 kHz	87	610		
1-10 MHz	$87/f^{1/2}$ (MHz)	610/*f* (MHz)		
10-400 MHz	28	61	2	10
400-2 000 MHz	$1.375f^{1/2}$ (MHz)	$3f^{1/2}$ (MHz)	*f*/200	*f*/40
2-300 GHz	61	137	10	50

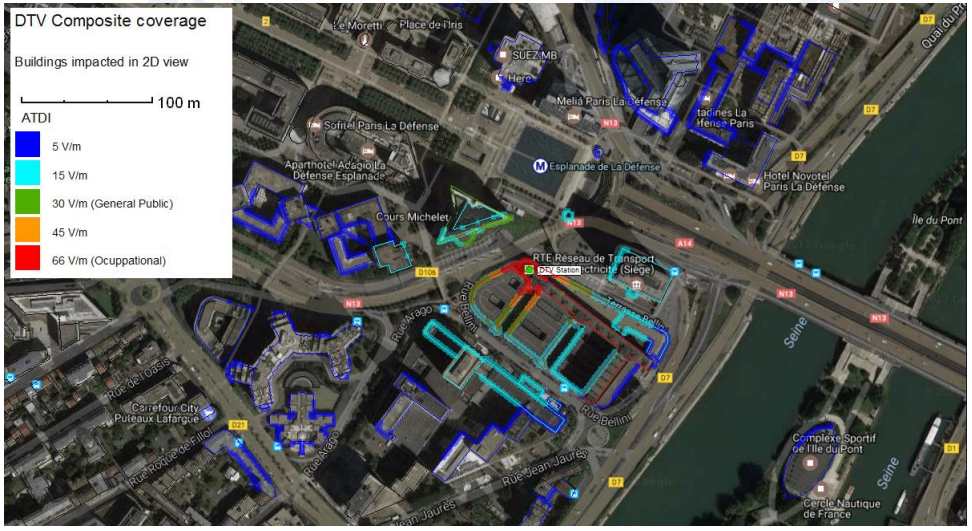
** Under development within ITU-R Study Group 1 – Spectrum management (www.itu.int/ITU-R/go/rsg1) by Working Party 1C – Spectrum monitoring: www.itu.int/ITU-R/go/rwp1c*

Presenting maps of calculated field-strength around transmitters, e.g.

Three dimensions DTV general-public and occupational exposure-contours

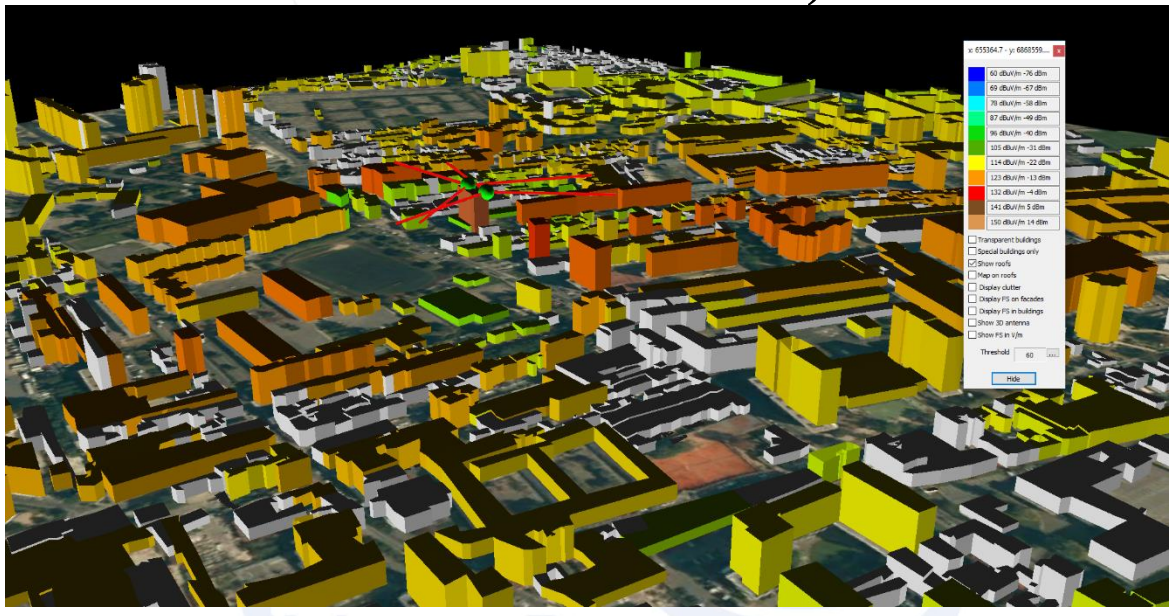


Two dimensions satellite view around DTV, impact on buildings

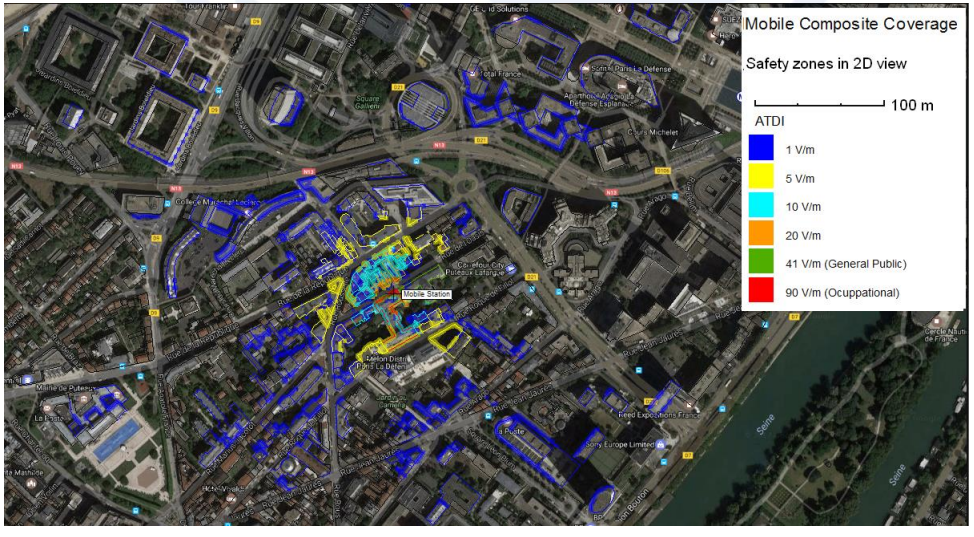


Presenting maps of calculated field-strength around transmitters, e.g.

Building color corresponds to the max FS received on a given point of the building (i.e. max FS on facades)



Two dimensions satellite view of cellular exposure-distances



A practical guide for EMF measurements to assess human exposure

- Basic knowledge for a successful EMF assessment measurement process
- Available types of measurement instruments with specific features for EMF assessment

- Personal monitor for occupational exposure

- Broadband meters

- Frequency selective meters

Frequency selective meter dedicated to EMF, with isotropic-antenna

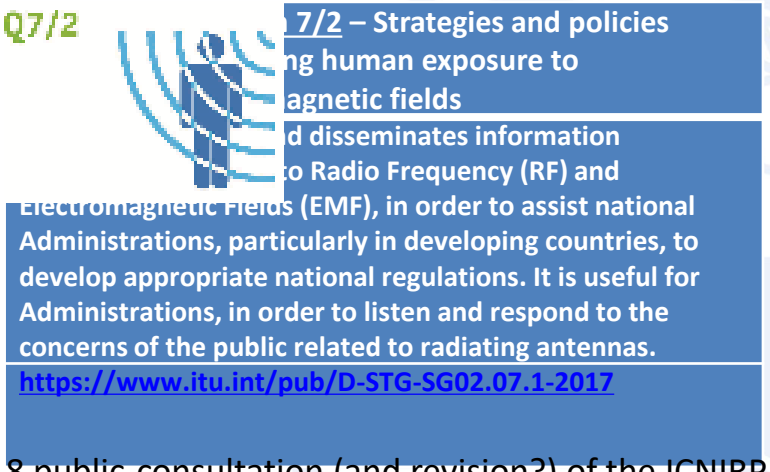
Handheld spectrum analyser with isotropic-antennas, 9 kHz to 6 GHz

- How to assess the exposure due to specific services
  - **General approach for services where extrapolation is not required**
  - **GSM base stations**
  - **UMTS base stations**
  - **LTE base stations**

ITU-D

Development Sector

Final Report of Q7/2



Following the 2018 public-consultation (and revision?) of the ICNIRP Guidelines the International EMF limits may change and influence the regulatory framework. New case studies are inserted.
Countries changed their exposure limits. The 2018 October Workshop provide significant view. Moreover, the there is a lot of ITU activities on EMF and the
ITU Plenipotentiary Conference PP-18 Resolution 176 (revision Dubai) may revise the PP-14 held in Busan,
ITU-T World Telecommunications Standardisation Assembly 2020 (WTSA-20) may revise WTSA-16 Resolution 72 (Hammamet)
ITU-D World Telecommunications Development Conference 2017 (WTDC-17) held in Buenos Aires, revised WTDC-14 Resolution 62 (Dubai),
Based on the revision of WTDC-14 Resolution 62 'Assessment and measurement of human exposure to electromagnetic fields' and the revision of Q 7/2 'Strategies and policies concerning human exposure to electromagnetic fields', this Report updates and revises the Question 7/2 Final Report and provides new material on Policies and Assessments.

Final Report

ITU-D
Study Group 2

Question 7/2

Strategies and policies concerning human exposure to electromagnetic fields

6th Study Period
2014-2017

WTDC-17

9-20 October 2017, Buenos Aires

Relevant results on EMF

1. ITU-D– Resolution 62 (Rev. WTDC-17) on "Measurement concerns related to human exposure to EMF"
2. ITU-D Question 7/2 (Continuation of Q 23/1 and Q7/2) *Strategies and Policies Concerning Human Exposure To Electromagnetic Fields*

Q7/2 Strategies and policies concerning human exposure to electromagnetic fields

- **Question or issue for study**

d) Information on the international (mainly in WHO, ICNIRP and IEEE) activities, including updated limits of exposure levels.

e) Challenges and opportunities of developing technical regulations on the limits for maximum exposure to non-ionizing electromagnetic radiation from radio base stations and specific absorption rate levels in wireless devices.

Q7/2 Strategies and policies concerning human exposure to electromagnetic fields

- **Expected outcome**

  b) The report will provide materials for workshops and seminars to share experiences on the establishment of limits for maximum exposure to non-ionizing electromagnetic radiation from radio base stations.

- **Sources of input**
- Member States, Sector Members, Associates and Academia.

ITU-D Q7/2

- ITU-D SG2 First meeting
- 9 May 2018: Q7/2
- Presented and discussed:
  - Work-plan
  - Structure of the report, items to study
  - Collaboration with other Sectors and Organisations
- Meeting report: **2/REP/7-E**
  - Annex 1: Work-plan
  - Annex 2: Draft Table of Content

New Q 7/2 Report ToC

CHAPTER 1 – Introduction

1.1 Background

1.2 Scope of the Report

CHAPTER 2 – ITU Activities

2.1 PP-18 Resolution 176 (revision Dubai)

2.2 WTDC-17 Resolution 62 (Rev. Buenos Aires, 2017)

2.3 ITU-R Radio Assembly 2019, Report SM.[EMF-MON] and deliveries of Question 239/1

2.4 ITU-T WTSA-20 Resolution 72, K. series Recommendations and deliveries of Question 3/5

CHAPTER 3 – Updated international and regional EMF activities and exposure limits

1. World Health Organization (WHO)
2. ICNIRP Guidelines and IEEE safety levels
3. Regional, national and comparative exposure limits

CHAPTER 4 – Policies to limit exposure to radiofrequency fields

4.1 Guidelines for national regulation

4.2 Best Practices of the use of mobile devices for exposure reduction

4.3 EMF exposure of next generation of mobile communications technologies.

4.4 Impact of IMT 2020 (5G) on EMF

4.5 Exposure to other radiators such as Wi-Fi, Bluetooth, wireless connected devices

4.6 EMF risks to animals and plants

CHAPTER 5 – National EMF activities on exposure limits

1. Legal framework
2. Assessment concerns related to human exposure to EMF
3. Public Awareness
4. Exposure limits nearby sensitive areas such as kindergartens, schools, hospitals
5. Maps of calculated field-strength around transmitters
6. Presentation of results on the web

New Q 7/2 Report ToC (Cont.)

5.7 Results of Questionnaire

CHAPTER 6 – Exposure levels from handsets and notebooks

6.1 Human exposure to EMF from base stations versus handsets and notebooks

6.2 Children exposure from handsets

6.3 National SAR measurements

CHAPTER 7 – Comparison of exposure limits in different countries

CHAPTER 8 – Case studies, success stories, and national practices

Relevant Presentations

1. Human Radio Frequency Exposure Limits: reference levels in Europe, USA, Canada, China, Japan & Korea
2. Human Radio Frequency Exposure Limits International, Regional and National
3. Coverage & EMF contours, around 5G base stations

Any Questions?