



ITU Regional Training Workshop on  
**“Human exposure to Electromagnetic Fields (EMF)  
& Specific Absorption Rate (SAR)” in the Arab Region**

**2-3 December 2019, Amman, JORDAN**

## ITU activities on EMF

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ITU-D



➤ **Study Group 2 Q7/2: Strategies and policies concerning human exposure to electromagnetic fields**

➤ Report 2014-2017 period

*The report collects and disseminates information concerning exposure to Radio Frequency (RF) and Electromagnetic Fields (EMF), in order to assist national Administrations, particularly in developing countries, to develop appropriate national regulations. It is useful for Administrations, in order to listen and respond to the concerns of the public related to radiating antennas.*

➤ WTDC-17 updated the Q7/2. Some issues to study:

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

*b) 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.*

*c) Description of the strategies or methods for raising the awareness of populations and increasing information to populations regarding the effects of human exposure to electromagnetic fields due to radiocommunication systems*

*d) Proposed guidelines and best practices on this matter.*

*e) Compilation and analysis of the regulatory policies concerning human exposure to electromagnetic fields that are being considered or implemented for authorizing the installation of radiocommunication sites and the monitoring powerline telecommunication systems.*

➤ **ITU-D– Resolution 62 (Rev. WTDC-17) on "Measurement concerns related to human exposure to EMF"**

➤ **Policies and legislation on EMF effecting 5G roll-out**

# Final Report of Q7/2

Q7/2



## Question 7/2 – Strategies and policies concerning human exposure to electromagnetic fields

This report collects and disseminates information concerning exposure to Radio Frequency (RF) and Electromagnetic Fields (EMF), in order to assist national Administrations, particularly in developing countries, to develop appropriate national regulations. It is useful for Administrations, in order to listen and respond to the concerns of the public related to radiating antennas.

<https://www.itu.int/pub/D-STG-SG02.07.1-2017>

Question 7/2

**Strategies and  
policies concerning  
human exposure to  
electromagnetic fields**

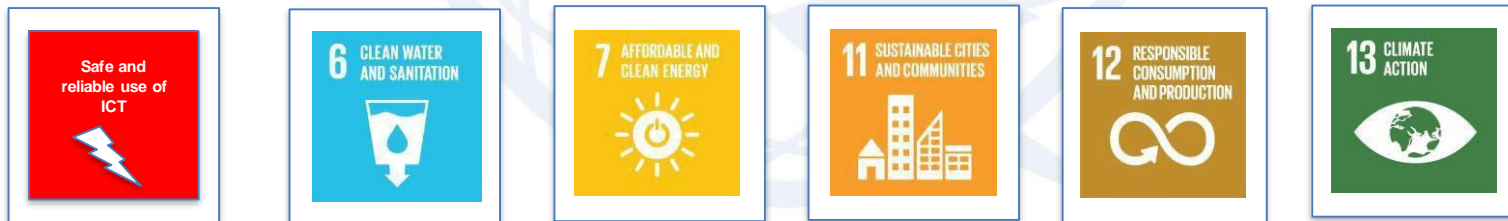
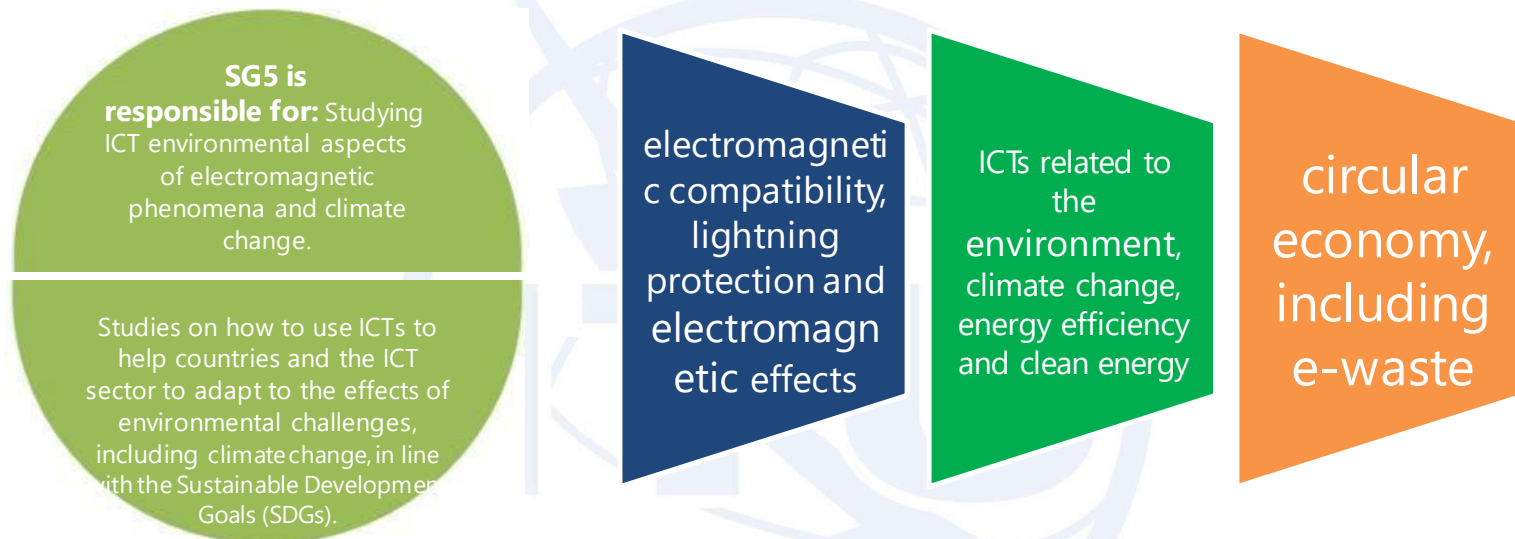
6th Study Period  
2014-2017

ITU-T



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

Lead Study Group for



9 Questions

4 Regional Groups

Q3/5 - Human exposure to electromagnetic fields (EMFs)



# 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 is available online at <http://emfguide.itu.int>.





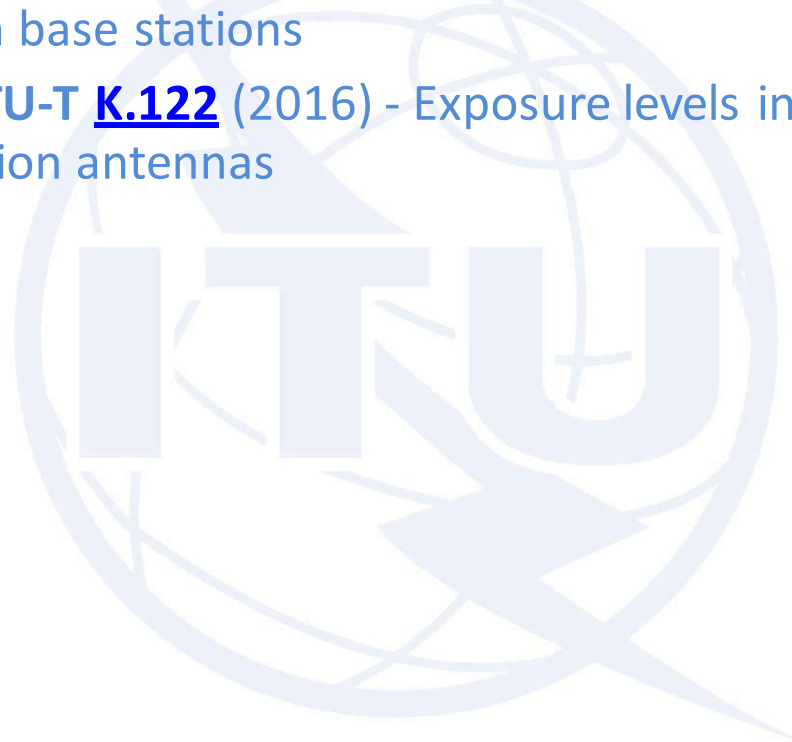
# ITU-T Recommendations on EMF assessment

- **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

S.uppl.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

## 6 New work items agreed:

- 1) Draft Recommendation ITU-T K.Zones - "Guidance on Determining the Compliance Boundaries (the exclusion zone) of a Live Antenna"
- 2) Draft Recommendation ITU-T K.Small - "Small base stations - impact on the overall exposure level"
- 3) Draft Recommendation ITU-T K.reflection - "Impact of the metallic structures for the EMF exposure level"
- 4) Draft Recommendation ITU-T K.peak - "Comparison between peak and real exposure in the long-term considerations"
- 5) Draft Recommendation ITU-T K.5G\_EMF\_Dosimeter – "Assessment and management of compliance with RF EMF exposure limits for workers at radiocommunication sites"
- 6) 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"



## **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**

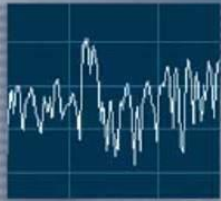
- Higher frequencies and higher throughput
- Shared infrastructure
- Smart antennas
- Small cells
- Internet of things (IoT), M2M



ITU-R

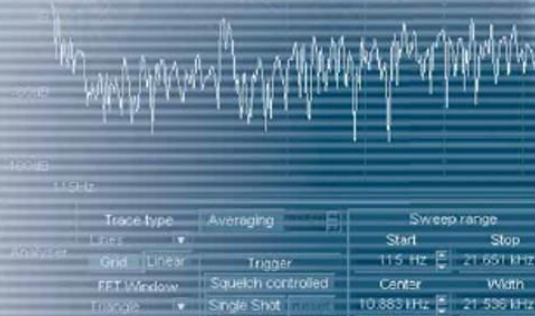


# ITU's worldwide recognized reference on



## Handbook

SPECTRUM MONITORING



RADIOCOMMUNICATION BUREAU



## 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**  
ITU-R Handbook on Spectrum Monitoring

Source:

[www.itu.int/pub/R-HDB-23](http://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](https://www.itu.int/dms_ties/itu-r/md/15/wp1c/c/R15-WP1C-C-0169!N09!MSW-E.docx)

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

Source:

Question ITU-R 239-1 - [www.itu.int/pub/R-QUE-SG01.239](http://www.itu.int/pub/R-QUE-SG01.239)





# 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**



# Impact of IMT-2020 (5G) technology on EMF

- The IMT-2020 (5G) system is planned for implementation in 2020.
- It is important to consider the impact of IMT-2020 (5G) technology with many new solutions (frequencies above 6 GHz, massive MIMO antennas, big number of micro base stations, IoT etc.) for the total exposure level.
- All ITU members are encouraged to deliver contributions concerning this important subject especially on:
  - The impact of IMT-2020 (5G) technologies on the compliance assessment methodology;
  - The deployment of smart antennas;
  - The use of Software Defined Radio;
  - The communication and understanding among stakeholders and general public related to the effect on human health.



# ITU framework on ElectroMagnetic Fields (EMF)

1. ITU Plenipotentiary Resolution 176 ([Rev Busan, 2014](#)): *Human exposure to and measurement of electromagnetic fields*
2. ITU-T – [Resolution 72](#) on “Measurement concerns related to human exposure to electromagnetic fields”
3. ITU-D– [Resolution 62](#) (Rev WTDC-174) on "Measurement concerns related to human exposure to EMF"
4. ITU-D Question [7/2](#) (Continuation of Q 23/1 and Q7/2) *Strategies and Policies Concerning Human Exposure To Electromagnetic Fields*
5. ITU-T SG5: Environment and Climate Change Question [C/5](#) (continuation of Q 3/5 and 7/5): Human exposure to electromagnetic fields (EMFs) due to radio systems and mobile equipment
6. ITU-R WP 1C: Spectrum Monitoring

# Inter-Sector ITU Activities

- ❖ Comments to the new ICNIRP guidelines on “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 from the inputs received during the ITU-T SG5 meeting, 32 comments have been included and sent to ICNIRP;
- ❖ [TD696-R1](#) and ICNIRP main [Revisions](#)
- ❖ Mapping of ITU-D/R/T EMF activities to avoid overlap, mainly:
  - ITU-D: **Strategies & Policies** concerning human exposure to EMF
  - ITU-R: EMF **measurements** from **base stations** to assess human exposure
  - ITU-T: **Simulation**, assessment, **5G**



# Structuring Practices & Challenges (based on replies)

- *National approach for the protection against non-ionizing radiation (NIR)*
  - If ICNIRP exposure limits / If more restrictive exposure limits (e.g. < 10% of ICNIRP)
- *Planning permissions / Authorisations to put into operation*
  - Calculation methods to assess human exposure
  - In support for efficient deployment of 5G: simplified procedures needed for
    - Small cells / Site modifications / Site sharing / Site access (e.g. public buildings and installations (street lighting posts))
- *Compliance (Measurement or calculation)*
  - ITU-T Recommendations
  - ITU-R Handbook on Spectrum Monitoring, Chapter 5.6 on “Non-ionizing radiation measurements”, including instruments for NIR measurements, associated measurement procedures and reporting.
  - IEC 62232:2017 «Determination of RF field strength, power density and SAR in the vicinity of radiocommunication base stations for the purpose of evaluating human exposure”
- *Communication*
  - Information for the General Public / Awareness campaigns
    - Building trust / Transparency / Cost/benefit analysis and define success measures including evaluation
    - / GSMA Booklet “5G, the Internet of Things (IoT) and Wearable Devices: What do the new uses of wireless technologies mean for radio frequency exposure?”
  - Between authorities (health, environmental, ICTs, local city councils)
  - Consider EMF management in National roadmap for 5G roll-out
- *Regional harmonisation of EMF management (particularly limits and technical compliance)*
  - The draft European Electronic Communications Code contains many articles that recommend harmonization based on the ICNIRP limits.

# Proposed Next Steps

- *The outcomes of the experts' meeting will be brought to the attention of the Study Groups of ITU-D, ITU-R and ITU-T.*
- *ITU possesses the expertise for compliance measurements and calculations. It is a joint effort of all the sectors of ITU and each has to contribute.*
  - Academia should be urged to continue to contribute to discussion in ITU through any of the sector (-R, or -T)
  - Realistic methods for compliance assessment with EMF exposure limits
- *Establish mechanisms for future collaboration between countries, and country case studies.*
- Proposed studies to be included in ITU-D SG Question 7/2 (revised by WTDC-17)*
  - Preparation of guidelines and case studies on public awareness on EMF issues
    - A guideline for a coherent approach for the standardized EMF levels across the ITU countries was called for.
    - Suggestions for communication, education, and information strategies in order to address public concern regarding human exposure to EMF and possible health effects would be welcome.
    - Compilation of good practices of local community communications and perception management.
    - Investigate utilization of ITU Interactive Transmission Map for EMF level
- *Request WHO to revise its background docs on EMF exposures from base stations and wireless networks in view of 5G Roll-out*
- *ITU-T EMF guide update in view of 5G roll out*
- *Investigate possible avenues for adjusting compliance processes for EMF level in countries where there are significant local differences between the theoretical and the actual exposure levels*
- *Contribution to the on-going studies within ITU-R Working Party 1C in response to Question ITU-R 239/2 "Electromagnetic field measurements to assess human exposure"*



# THANK YOU

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