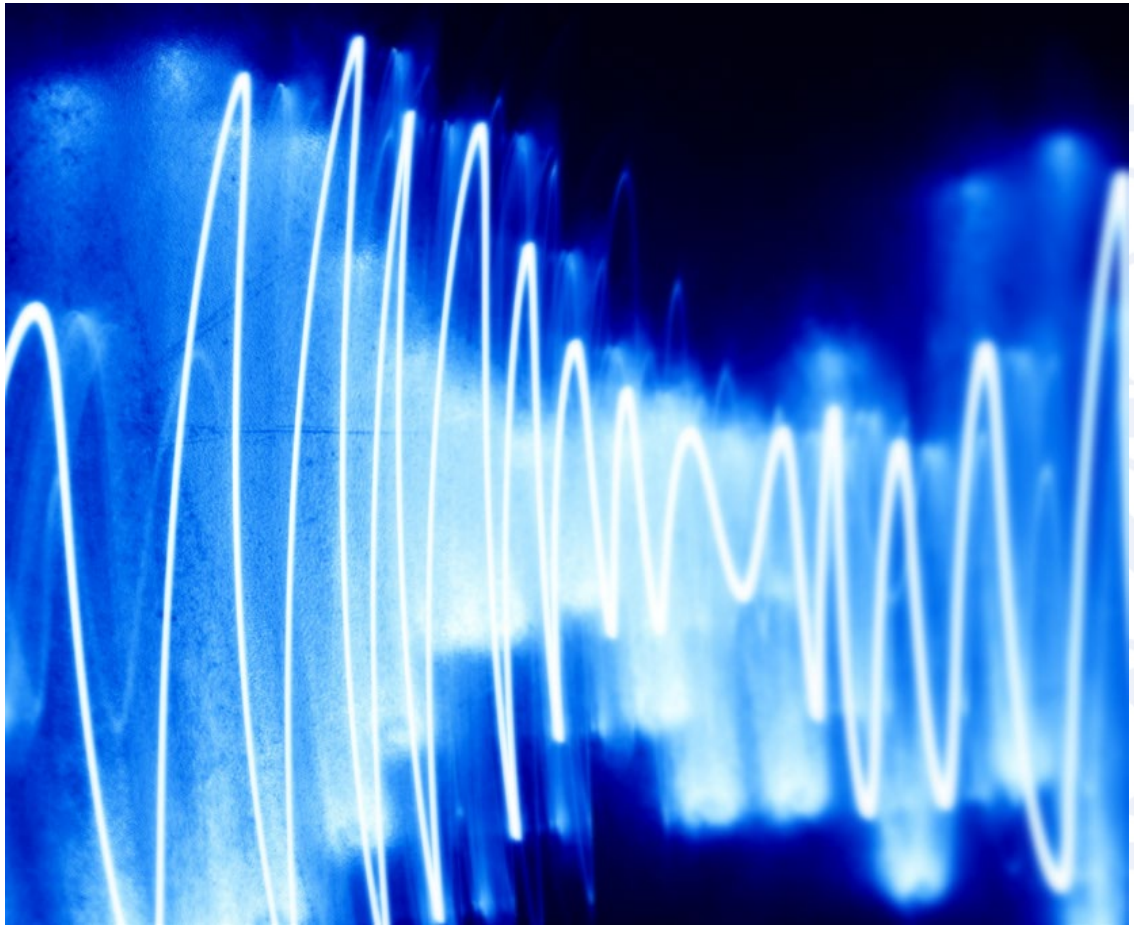
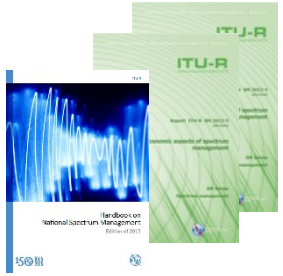


ITU-R studies on Spectrum Monitoring

International spectrum management framework



ITU Constitution, Convention	Plenipoten-tiary Conf.	High level principles
Radio Regulations Bi/multilateral Agreements	WRC RRC RRB	Rights and Obligations Table of Frequency Allocations Satellite orbit/terrestrial Plans Frequency coordination Frequency registration Interference Rules of Procedure…
ITU-R Recommendations	RA	
ITU-R Reports, Handbooks, software tools	Study Groups WPs, TGs	Technical characteristics Sharing criteria/assessment Spectrum management Operational aspects …

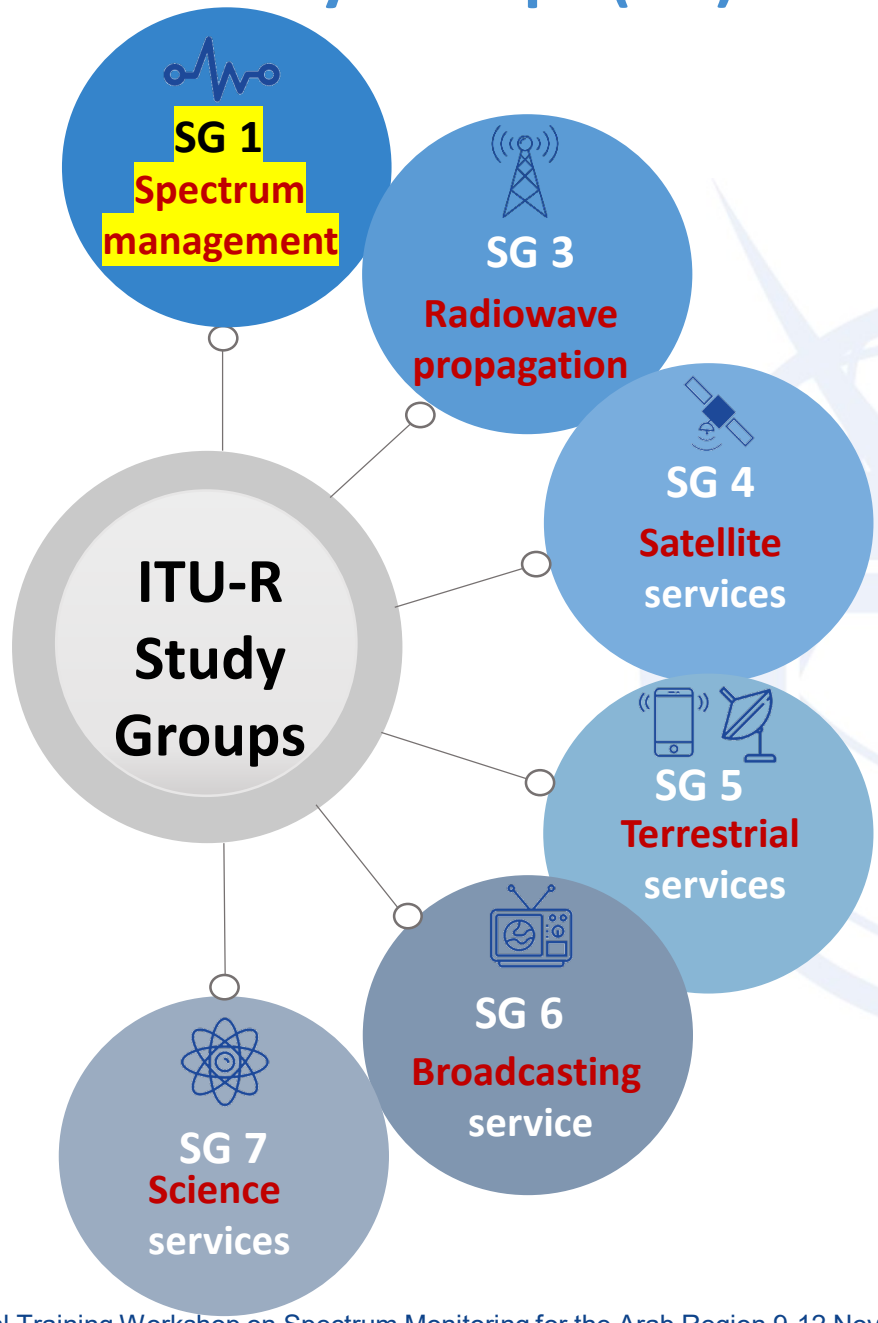
RRB: Radio Regulations Board
RRC: Regional Radiocommunication Conference
WRC: World Radiocommunication Conference
RA: Radiocommunication Assembly
WPs: Working Parties
TG: Task Groups

Radiocommunication Assembly 2019

- Held on 21 – 25 October 2019, in Sharm El-Sheikh, Egypt
- 521 participants, 91 ITU Member States, 48 ITU-R Sector members
- Maintained the ITU-R structure with **6** **ITU-R Study Groups**, **CCV**, **RAG** and **CPM**,
  Appointed **Chairmen and Vice-Chairmen** of these groups (see Res. ITU-R 4-8 & Doc. 84)
  Approved **programme of work/Questions** (Res. ITU-R 5-8) & **working methods** (Res. ITU-R 1-8 & 2-8)
- Approved **23** **revised** **ITU-R Resolutions** and **2** **new** **ITU-R Resolutions** (on broadcasting)
- Approved **5** **ITU-R Recommendations** (including one on frequency arrangements for terrestrial IMT)

ITURA SHARM EL-SHEIKH2019
21 - 25 October
Sharm El-Sheikh, Egypt

ITU-R Study Groups (SG)



SG 1

- WP 1A – Spectrum **engineering techniques**
- WP 1B – Spectrum **management methodologies** and **economic strategies**
- WP 1C – Spectrum **monitoring**

SG 3

- WP 3J – Propagation **fundamentals**
- WP 3K – **Point-to-point** propagation
- WP 3L – **Ionospheric** propagation and **radio noise**
- WP 3M – **Point-to-point** and **Earth-space** propagation

SG 4

- WP 4A – **Efficient orbit/satellite utilization** for **FSS and BSS**
- WP 4B – **Systems**, **air interfaces**, **performance** and **availability objectives** for **FSS, BSS and MSS** (incl. IP-based applications and SNG)
- WP 4C – **Efficient orbit/satellite utilization** for **MSS and RDSS**

SG 5

- WP 5A – **Land mobile > 30 MHz**, **fixed WAS**, **amateur** & **amateur-satellite**
- WP 5B – **Maritime** and **aeronautical** mobile services and **radiodetermination**
- WP 5C – **HF and other systems < 30 MHz** in the **fixed and land mobile services**
- WP 5D – **IMT systems**

SG 6

- WP 6A – Terrestrial broadcasting **delivery**
- WP 6B – Broadcast service **assembly and access**
- WP 6C – **Programme production** and **quality assessment**
- TG 6/1 – **WRC-23 agenda item 1.5** (use of the band 470-960 MHz)

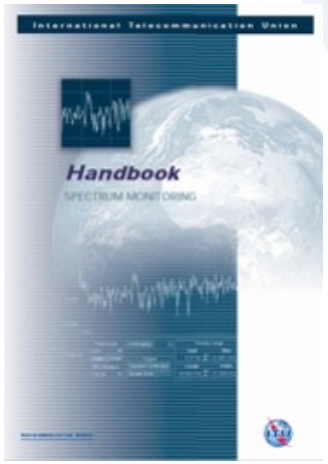
New

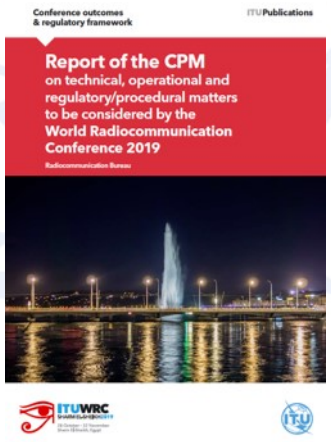
SG 7

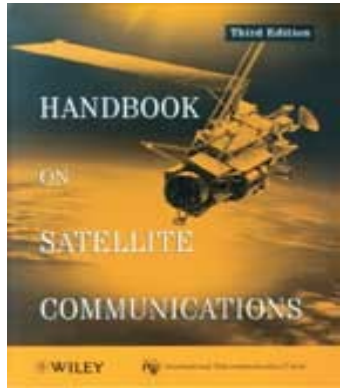
- WP 7A – **Time signals** and **frequency standard emissions**
- WP 7B – Space radiocommunication applications: **space operation, space research**, **Earth exploration**, **meteorological** satellite services
- WP 7C – **Remote sensing** systems (active and passive): **Earth exploration-satellite, MetAids, space research services**
- WP 7D – **Radio astronomy**

ITU-R Study Groups Products

- ITU-R Recommendations
- ITU-R Reports and Handbooks
- Technical bases for radio conferences







ITU-R Recommendations/Report series

Series	Title
BO	Satellite delivery
BR	Recording for production, archival and play-out; film for television
BS	Broadcasting service (sound)
BT	Broadcasting service (television)
F	Fixed service
M	Mobile, radiodetermination, amateur and related satellite services
P	Radiowave propagation
RA	Radio astronomy
RS	Remote sensing systems
S	Fixed-satellite service
SA	Space applications and meteorology
SF	Frequency sharing and coordination between fixed-satellite and fixed service systems
SM	Spectrum management
SNG	Satellite news gathering
TF	Time signals and frequency standards emissions
V	Vocabulary and related subjects

SG 1	→	SM
SG 3	→	P
SG 4	→	M, S, SF, SNG
SG 5	→	M, F, SF
SG 6	→	BO, BR, BS, BT
SG 7	→	RA, RS, SA, TF
CCV	→	V

BR Publication Search Tool

Description of the texts* assigned to the ITU-R Study Groups and sub-groups

- **Spectrum Management** (SG 1, see Doc. 1/1)
- **Radiowave Propagation** (SG 3, see Doc. 3/1)
- **Satellite Services** (SG 4, see Doc. 4/1)
- **Terrestrial Services** (SG 5, see Doc. 5/1)
- **Broadcasting Service** (SG 6, see Doc. 6/1)
- **Science Services** (SG 7, see Doc. 7/1)

* ITU-R Questions, Recommendations, Reports, Handbooks, Resolutions, Opinions, Decisions
W(A)RC Resolutions and Recommendations

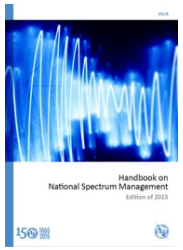
ITU-R Collaboration with other sectors and organizations

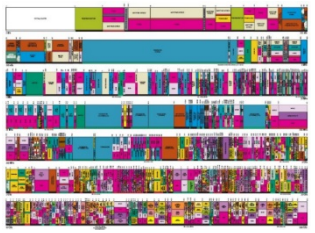
- **ITU-T** (Res. ITU-R 6-3)
- **ITU-D** (Res. ITU-R 7-4)
- **Other relevant organizations,** incl. ISO, IEC **& CISPR** (Res. ITU-R 9-6)

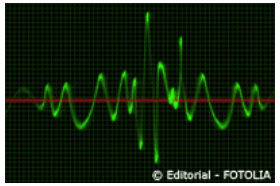
Study Group 1
Spectrum Management

Propagation of radio waves in ionized and non-ionized media and the characteristics of radio noise, for the purpose of improving radiocommunication systems

- Spectrum management -principles & techniques
- General principles of sharing
- Spectrum monitoring
- Long-term strategies for spectrum utilization
- Economic approaches to national spectrum management







Chairman: Mr. Wael SAYED
Counsellor: Mr. Philippe AUBINEAU

SG 1 & WPs Chairmen & Vice-Chairmen

Study Group 1 – Spectrum Management (details online)

Chairman: **Mr W. SAYED *** **Egypt (Arab Rep. of)** ** New since RA-19 (see Res. ITU-R 4-8)*

Vice-Chairmen:	
Mr M. AYOUB *	Lebanon
Mr G. ABDULLAYEV*	Azerbaijan (Rep. of)
Mr. A.W. AHMED*	Iraq (Rep. of)
Mr J.A. AL MAHRUQI	Oman (Sultanate of)
Mr G. CHAND*	India (Rep. of)
Mr S. COULIBALY*	Mali (Rep. of)
Mr R. GARCIA DE SOUZA*	Brazil (Federative Rep. of)
Mr M. HAJI *	Kenya (Republic of)
Mr T.H. LE	Viet Nam (Socialist Rep. of)

Vice-Chairmen:	
Dr I.-K. LEE	Korea (Rep. of)
Mr A. NALBANDIAN*	Armenia (Rep. of)
Dr G. OWEN	Netherlands (Kingdom of the)
Dr A. SCOTTI	Italy
Ms B. SYKES	United States of America
Ms. T. SUKHODOLSKAIA*	Russian Federation
Mr. Z. ZHAO*	China (People's Rep. of)
Mrs S. ZAIRI*	Morocco (Kingdom of)

Working Party 1A – Spectrum engineering techniques (details online)

Chairman:	Mr R. GARCIA DE SOUZA	Brazil (Federative Rep. of)
Vice-Chairman:	Dr G. OWEN	Netherlands (Kingdom of the)

Working Party 1B – Spectrum management methodologies and economic strategies (details online)

Chairman:	Mr L. KIBET BORUETT	Kenya (Rep. of)
Vice-Chairman:	Mr B. LIU	China (People's Rep. of)

Working Party 1C – Spectrum monitoring (details online)

Chairman:	Mr R. TRAUTMANN	Germany (Federal Rep. of)
Vice-Chairman:	Mr M. AL-SAWAFI	Oman (Sultanate of)

RA Resolutions of interest to SG 1

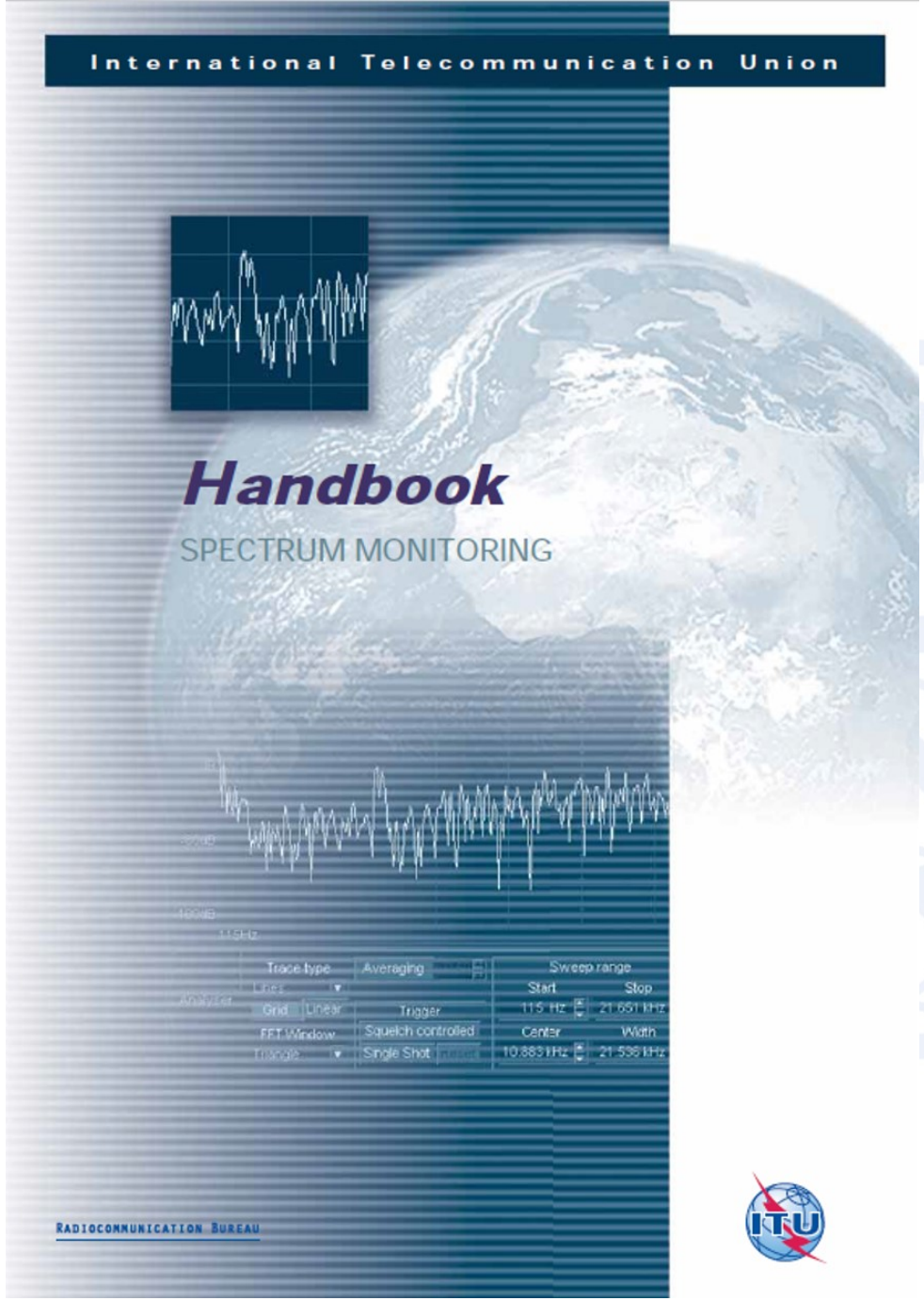
Res. ITU-R	Title	WP
11-5	Further development of the **SM system for developing countries**	1A
22-5 *	Improvement of **national radio SM practices and techniques**	1B
23-3	Extension of the **international monitoring system** to a worldwide scale	1C
54-3 *	Studies to achieve harmonization for **short-range devices**	1B **
55-3 *	ITU studies of **disaster prediction, detection, mitigation and relief**	1B, 1C
58-2 *	Studies on the implementation and use of **cognitive radio systems**	1A, 1B, [1C]
59-2 *	Studies on availability of frequency bands for worldwide and/or regional harmonization and conditions for their use by **terrestrial electronic news gathering systems**	1B
60-2 *	Reduction of energy consumption for environmental protection and mitigating climate change by use of ICT/radiocommunication technologies and systems	1B
61-2 *	ITU-R's contribution in implementing the outcomes of the **World Summit on the Information Society and the 2030 Agenda for Sustainable Development**	1A, 1B
62-2 *	Studies related to testing for conformance with ITU-R Recommendations and interoperability of radiocommunication equipment and systems	1B
64	Guidelines for the management of **unauthorized operation of earth station terminals**	1B, 1C
66-1 *	Studies related to wireless systems and applications for the development of the **Internet of Things (IoT)**	1A, 1B
67-1 *	Telecommunication/ICT accessibility for persons with disabilities and persons with specific needs	All 3

** Revised at RA-19 ** Working Party 1A may also be involved upon request from Working Party 1B*

ITU-R Questions within SG 1

Question ITU-R	Title	WP
205-2/1	Long-term strategies for spectrum utilization	1B
208-1/1	Alternative methods of national spectrum management	1B
210-3/1	Wireless power transmission (WPT)	1A *
216-1/1	Spectrum redeployment as a method of national spectrum management	1B
221-2/1	Compatibility between radiocommunication systems and high data telecommunication systems using wired electrical power supply	1A
222/1	Definition of the spectral properties of transmitter emissions	1A
232/1	Methods and techniques used in space radio monitoring	1C
235/1	Spectrum monitoring evolution	1C
236/1	Impact on radiocommunication systems from wireless & wired data transmission technologies used for the support of power grid management systems	1A
237/1	Technical and operational characteristics of the active services operating in the range 275-1 000 GHz	1A
238/1	Characteristics for use of visible light for broadband communications	1A
239/1	EMF measurements to assess human exposure	1C
240/1	Assessment of spectrum efficiency and economic value	1B
241/1	Methodologies for assessing or predicting spectrum availability	1B

* *Question ITU-R 210-3/1 was assigned to both Working Parties 1A and 1B prior to the June 2019 meeting of SG 1.*



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**

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

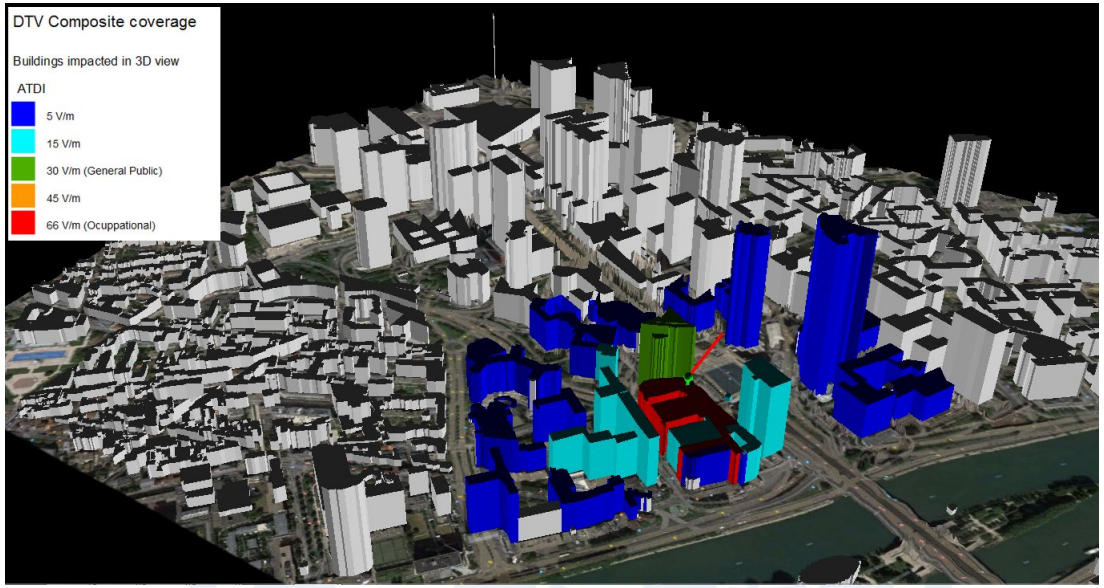
- WP 1C studies in response to Question ITU-R 239/1

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

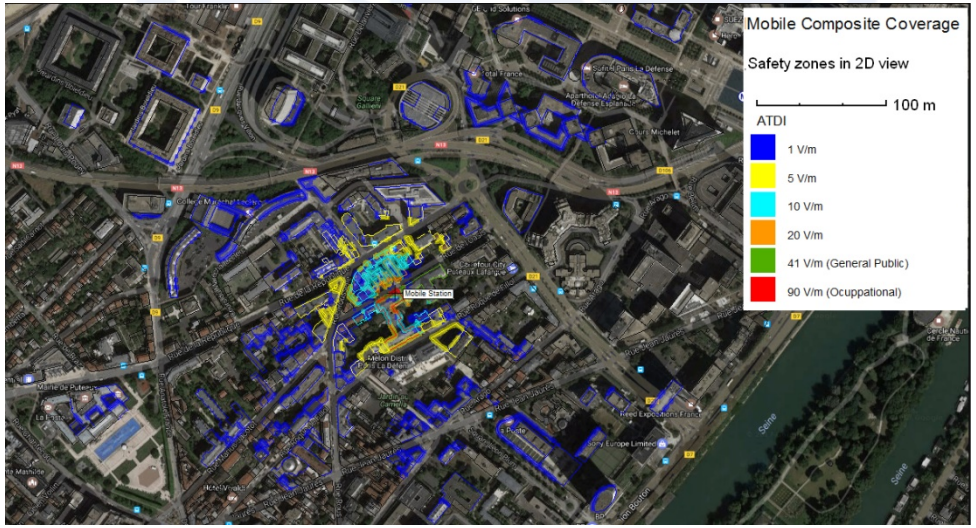
- First studies completed in 2019
- Approval of Report ITU-R SM.2452-0
- Studies will continue at the next ITU-R WP 1C meeting from 24 November to 2 December 2020, including references to the recent publications of ICNIRP (2020) (replacing the 100 kHz to 300 GHz part of the ICNIRP (1998) guidelines)

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

Three dimensions DTV general-public and occupational exposure-contours



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**
- **Measurement instruments with specific features for EMF assessment**

- Personal monitor

- 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

- **Reducing the number of measurement points in space**
- **Reducing the observation time and extrapolation to the maximal exposure**
- **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 - Wi-Fi access points**

Other WP 1C on-going studies (1/2)

✓ on Performance evaluation of mobile DF units in operational environment

- WD PDN Rec. ITU-R SM.[MOB DF PERF] (Annex 1 to the WP1C Chairman's Report)
  - ***Rapporteur Group Mailing List:*** rwp1c-cg-mob-df@itu.int ***(SharePoint),***
    Rapporteur: **Mr A. Agius** (see ToR in Annex 2 to the WP1C Chairman's Report)

✓ on Population coverage measurement with public wireless networks

- WD PDN Rep. ITU-R SM.[POPULATION_COVERAGE] (Annex 14 to the WP1C Chairman's Report)
  - ***Correspondence Group (CG) Mailing List:*** rwp1c-cg-pop-cov@itu.int ***(SharePoint)***
    Chairman: **Mr V. Blagodarnyi**

✓ on Test procedure for measuring accuracy of TDOA emitter location systems

- [WD]PDN Rec. ITU R SM.[TDOA-ACC] (see Annex 6 to the WP1C Chairman's Report)
  - ***CG ML:*** rwp1c-cg-tdoa-acc@itu.int ***(SharePoint), Chairman:*** **Mr J. Yang**

✓ on Essential requirements for a spectrum monitoring system for developing countries

- PDR of Rec. ITU-R SM.1392-2 (see Annex 7 to the WP1C Chairman's Report)
  - ***CG ML:*** rwp1c-cg-1392@itu.int ***(SharePoint), Chairman:*** **Mr M. Al-Sawafi**

✓ on Reporting harmful interference in support of RR Appendix 10

- WD PDN [Rec./Rep.] ITU-R SM.[APP10] (see Annex 11 to the WP1C Chairman's Report)

Other WP 1C on-going studies (2/2)

✓ **on Test procedure for measuring monitoring system field strength measurement accuracy in the VHF/UHF frequency range**

➢ WD PDN Rec. ITU-R SM.[FS-ACC] (see Annex to the WP1C Chairman's Report)

- **CG *ML:*** rwp1c-cg-fs-accuracy@itu.int ***(SharePoint), Chairman:*** **Mr J. Wang**

✓ **on Use of commercial drones operating within visible line of sight for measurement of own country spectrum**

➢ WD PDN Report ITU-R SM.[UAVs] (see Annex 3 to the WP1C Chairman's Report)

- **CG *ML:*** rwp1c-cg-uav-mon@itu.int ***(SharePoint),***
  Chairman: Dr. K. Kim (kangheekim@etri.re.kr***)*** (see ToR in Annex 4 to the WP1C Chairman's Report)

✓ **on Use of small satellites for Spectrum Monitoring**

➢ WD PDN Report ITU-R SM.[SMALL-SAT] (see Annex 9 to the WP1C Chairman's Report)

- ***CG ML:*** rwp1c-cg-small-sat@itu.int ***(SharePoint),***
  Chairman: **Mr C. Hao** (see ToR in Annex 10 to the WP1C Chairman's Report)

✓ **on Spectrum Monitoring Handbook**

- ***CG ML:*** rwp1c-handbook@itu.int ***(SharePoint)***
  Chairman: **Mr R. Trautmann** (see ToR in Annex 12 to the WP1C Chairman's Report)

Thank you for your attention

philippe.aubineau@itu.int

Counsellor for ITU-R SG1 & CPM

ITU-R Study Groups: www.itu.int/ITU-R/go/rsg

Email: ***brsgd@itu.int***

ITU-R Study Group 1:
www.itu.int/ITU-R/go/rsg1, Email: rsg1@itu.int

ITU-R Working Party 1C:
www.itu.int/ITU-R/go/rwp1c

ITU-R Study Groups

Additional slides on

- **Relevant ITU-R Recommendations & Reports approved in 2019**

➢ Opportunities to participate/contribute to the next WP 1C e-meeting from 24 November to 2 December 2020 (see details in BR 1/LCCE/106)

WP 1C approved publications after May-June 2019 (1/2)

✓ **Studies on Method of measuring the maximum frequency deviation of FM broadcast emissions at monitoring stations**

➢ Rec. ITU-R SM.1268-5 (Approved in Aug. 2019)

✓ **Studies on Monitoring of radio emissions from spacecraft at monitoring stations**

➢ Rec. ITU-R SM.1054-1 (Approved in Aug. 2019)

✓ **Studies on DVB-T/T2 coverage measurements and evaluation of planning criteria**

➢ Rec. ITU-R SM.1875-3 (Approved in Aug. 2019)

✓ **Studies on EMF measurements to assess human exposure**

➢ **New** Report ITU-R SM.2452-0 (ex.[EMF-MON]) (Approved in June 2019)

✓ **Studies on Cooperation in the field of space radio monitoring**

➢ **New** Report ITU-R SM.2453-0 (ex.[SAT MON COOPERATION]) (Approved in June 2019)

WP 1C approved publications after May-June 2019 (2/2)

✓ **Studies on Assessment of electromagnetic environment in the GNSS frequency bands**

➢ **New** Report ITU-R SM.2454-0 (ex. [MEAS-GNSS]) (Approved in June 2019)

✓ **Studies on Measurement facilities available for the measurement of emissions from both GSO and non-GSO space stations**

➢ Report ITU-R SM.2182-3 (Approved in June 2019)

✓ **Studies on Spectrum Monitoring Evolution**

➢ Report ITU-R SM.2355-1 (Approved in June 2019)

✓ **Studies on Spectrum management and monitoring during major events**

➢ Report ITU-R SM.2257-5 (Approved in June 2019)

✓ **Review of relevant ITU-R Recommendations in SM series**

➢ 30 ITU-R Recommendations related to the WP 1C activities were editorially updated in June 2019