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ITU-R
Radiocommunication Sector of ITU

Recommendation ITU-R BT.1871-2
(12/2017)

User requirements for wireless microphones

BT Series
Broadcasting service
(television)

Foreword

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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

Note: This ITU-R Recommendation was approved in English under the procedure detailed in Resolution ITU-R 1.

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RECOMMENDATION ITU-R BT.1871-2

User requirements for wireless microphones

(Question ITU-R 121/6)

(2010-2015-2017)

Scope

This Recommendation deals with user requirements for wireless microphones. It contains typical system parameters and operational requirements for analogue and digital wireless microphones, which may be used by administrations and broadcasters when planning tuning ranges within the frequency bands allocated to broadcasting, fixed and mobile service.

The ITU Radiocommunication Assembly,

considering

- a) that separate applications exist for broadcast and non-broadcast application of wireless microphones;
- b) that separate applications exist for news, sports, drama, light entertainment, studio and non-studio programme production within broadcasting use of wireless microphones;
- c) that there is a requirement within a wireless microphone system to assign a range of selectable frequencies to each system to permit frequency management and mitigate interference;
- d) that wireless microphones are currently assigned frequencies in bands allocated to the mobile service in Region 3 and those allocated to the broadcasting service in Regions 1 and 2, and many administrations are undertaking the transition from analogue to digital terrestrial television broadcasting;
- e) that wireless microphone systems are used in many countries, and are deployed for television production in other countries by national broadcasting organizations;
- f) that many administrations use TV Bands IV and V, which are also allocated to the mobile service in Region 3, as tuning ranges for professional wireless microphones;
- g) that it is desirable to minimize the potential for interference in these systems, while minimizing frequency management resource requirements, mitigating interference and increasing global harmonization of the selectable frequencies,

recommends

- 1** that the description of the user requirements and key characteristics of analogue and digital wireless microphones in Annex 1 should be referred to by administrations seeking to operate these applications in the frequency bands indicated;
- 2** that the tuning ranges and licensing arrangements for analogue and digital wireless microphones in Annex 2 should be referred to by administrations and broadcasters seeking information.

Annex 1

User requirements for wireless microphones

Table 1 provides the description of the user requirements and key characteristics of analogue and digital wireless microphones which should be referred to by administrations seeking to operate these applications.

TABLE 1
User requirements for radio/wireless microphones

Characteristics	Specification
Application	Voice (speech, song), music instruments
Transmitter	
Placement of a transmitter	Body worn or handheld
Power source	Battery
Transmitter RF-output power	10 to 100 mW
Transmitter audio input	Microphone level
Receiver	
Placement of a receiver	Fixed/camera mounted
Power source	a.c. mains/battery
Receiver audio output	Line level
Receiver type	Single or diversity
General	
Battery/power pack operation time	> 4-8 h
Audio frequency response	≤ 80 to ≥ 15.000 Hz
Audio mode	Mono
RF frequency ranges	TV Bands III/IV/V, 1.8 GHz
Signal-to-noise ratio (optimal/possible)	> 100/119 dB
Modulation	Analogue – FM wideband, Digital – Shift QPSK
RF peak deviation (AF = 1 kHz)	± 50 kHz
RF bandwidth	≤ 200 kHz
Number of useable wireless microphone channels per 8 MHz	> 12

Annex 2

Tuning ranges of wireless microphones

The tuning ranges of wireless microphones are intended to guide administrations and broadcasters seeking to operate analogue and digital wireless microphones and when considerations are made to frequency sharing with other services.

Table 2 provides frequency bands and licensing arrangements within some administrations.

TABLE 2

Frequency bands and licensing arrangements

Country	Frequency tuning range	Licensing arrangement(s)
Australia	VHF Band III – 174-230 MHz	Class license permits up to 3 mW e.i.r.p. (note an increase to 50 mW e.i.r.p. is under consideration) Australian standard AS/NZS 4268 ⁽¹⁾ on short-range devices specifies 0.1 μ W for spurious emission level into an adjacent channel.
	520-694 MHz	Up to 100 mW e.i.r.p. Some (much less commonly used) apparatus licensing for higher powered uses up to 250 mW e.i.r.p. (for digital systems) Australian standard AS/NZS 4268 ⁽¹⁾ on short-range devices specifies 0.1 μ W for spurious emission level into an adjacent channel.
	1 785-1 800 MHz	The maximum e.i.r.p. is 100 mW Transmitters must not be operated on frequencies within 1 MHz of 1 785 MHz and transmitters using frequencies below 1 790 MHz must only be used indoors. These proposed limitations on 4 MHz of the proposed additional permitted operating frequency band are to provide for co-existence with adjacent services. Australian standard AS/NZS 4268 ⁽¹⁾ on short-range devices specifies 0.1 μ W for spurious emission level into an adjacent channel.

TABLE 2 (continued)

Country	Frequency tuning range	Licensing arrangement(s)
Japan	40.68 MHz, 42.89 MHz	Maximum antenna input power: 10 mW (for analogue systems)
	44.87 MHz, 47.27 MHz	
	470-714 MHz ⁽⁶⁾⁽⁷⁾	Maximum antenna input power: 10 mW (for analogue system) 50 mW (for digital system)
	779.125-787.875 MHz ⁽⁵⁾	Maximum antenna input power: 10 mW (for analogue systems)
	797.125-805.875 MHz ⁽⁵⁾	
	770.250-778.750 MHz ⁽⁵⁾	Maximum antenna input power: 50 mW Tolerance of antenna input power: -50% to +50% Minimum operational channel spacing: 500 kHz for 128 ksymbol/s Maximum occupied bandwidth: 288 kHz Maximum number of simultaneous operable channels at 9 MHz bandwidth: 18 ch (for digital systems)
	778.875-797.125 MHz ⁽⁵⁾	
	797.250-805.750 MHz ⁽⁵⁾	
	1 240-1 252 MHz 1 253-1 260 MHz ⁽⁷⁾	Maximum antenna input power: 50 mW (for analogue/digital systems)
France ⁽²⁾	174-223 MHz ⁽³⁾	e.r.p. max = 50 mW (17 dBm)
	470-694 MHz ⁽³⁾	e.r.p. max = 50 mW (17 dBm)
	694-790 MHz ⁽³⁾	until 01/07/19, depending on the area e.i.r.p. max = 13 to 19 dBm/200 kHz ⁽⁴⁾
	823-832 MHz ⁽³⁾	See 2014/641/EU
	863-865 MHz	e.r.p. max = 10 mW, see ARCEP decision 2014-1263
	1 785-1 805 MHz ⁽³⁾	Secondary usage e.i.r.p. max = 20 up to 50 mW
Korea	72.610-73.910 MHz, 74.000-74.800 MHz, 75.620-75.790 MHz	10 mW e.r.p. and BW up to 60 kHz
	173.020-173.280 MHz, 217.250-220.110 MHz, 223.000-225.000 MHz	10 mW e.r.p. and BW up to 200 kHz
	470-698 MHz	250 mW e.r.p. and BW up to 200 kHz (for SAB/SAP and licensed only)
	925.000-937.500 MHz	10 mW e.r.p. and BW up to 200 kHz

TABLE 2 (continued)

Country	Frequency tuning range	Licensing arrangement(s)
Canada ⁽⁸⁾	26.10-26.48 MHz 88-107.5 MHz	1 W e.r.p. and BW up to 200 kHz
	450-451 MHz 455-456 MHz	1 W e.r.p. and BW up to 200 kHz, only for auxiliary-to-broadcast use
	54-72 MHz 76-88 MHz 174-216 MHz	Maximum antenna input power: 50 mW BW up to 200 kHz
	150-174 MHz	Maximum antenna input power: 50 mW BW up to 54 kHz
	470-608 MHz 614-698 MHz	Maximum antenna input power: 50 mW BW up to 200 kHz
Germany	32.475-38.125 MHz	10/50 mW e.r.p. ⁽⁹⁾ ⁽¹⁰⁾
	174-230 MHz	50 mW e.r.p., BW up to 200 kHz, channel raster 25 kHz ⁽¹⁰⁾
	470-608 MHz, 614-703 MHz, 733-823 MHz	50 mW e.r.p., BW up to 200 kHz, channel raster 25 kHz ⁽¹⁰⁾
	823-832 MHz	82/100 mW e.i.r.p. ⁽⁹⁾
	863-865 MHz	10 mW e.r.p., BW up to 200 / 300 kHz ⁽⁹⁾
	1 350-1 400 MHz	50 mW e.i.r.p., indoor only ⁽¹⁰⁾
	1 452-1 492 MHz	50 mW e.i.r.p. ⁽¹⁰⁾
	1 492-1 518 MHz	50 mW e.i.r.p., indoor only ⁽¹⁰⁾
1 785-1 805 MHz	82 mW e.i.r.p. ⁽⁹⁾	
United States of America	26.1-26.48 MHz (VHF)	up to 1 W conducted power and 200 kHz bandwidth
	161.625-161.775 MHz (VHF)	up to 1 W conducted and 200 kHz bandwidth (not permitted in Puerto Rico and the Virgin Islands)
	Portions (specific frequencies) of 169-172 MHz band (VHF)	up to 50 mW, up to 200 kHz bandwidth on certain frequencies, up to 54 kHz bandwidth on other specific frequencies

TABLE 2 (end)

Country	Frequency tuning range	Licensing arrangement(s)
United States of America	88-108 MHz (FM)	Unlicensed, up to 250 microvolts/meter at 3 meters, up to 200 kHz bandwidth.
	450-451 MHz, 455-456 MHz (UHF)	up to 1 W conducted power and 200 kHz bandwidth
	54-72 MHz, 76-88 MHz, 174-216 MHz, 470-608 MHz, 614-616 MHz, 653-663 MHz (VHF and UHF)	VHF: up to 50 mW e.i.r.p. (licensed and unlicensed) UHF TV Band (470-608 MHz): up to 250 mW conducted power for licensed operators, 50 mW e.i.r.p. for unlicensed operation. (488-494 not permitted in Hawaii) UHF Guard band (614-616 MHz) and Duplex (653-663 MHz): up to 20 mW e.i.r.p.
	941.500-952.000 MHz, 952.850-956.250 MHz, 956.45-959.85 MHz (UHF)	up to 1 W conducted power and 200 kHz bandwidth
	1 435-1 525 MHz	on a secondary basis with prior coordination with the Aerospace and Flight Test Radio Coordinating Council (AFTRCC), up to 250 Mw and 200 kHz bandwidth
	6 875.000-6 900.000 MHz, 7 100.000-7 125.000 MHz	up to 250 Mw and 200 kHz bandwidth
	902-928 MHz, 2.4 GHz, 5 GHz (ISM bands)	Unlicensed, frequency hopping and digitally modulated systems are permitted to use output powers of up to 1 watt
	1 920-1 930 MHz (unlicensed PCS)	Unlicensed, indoor operation only, power limits and other restrictions set forth in FCC part 15 subpart D
	Ultra-wideband (3.1-10.6 GHz)	Unlicensed, indoor operation only, power limits and other restrictions set forth in FCC part 15 subpart F

- (1) AS/NZS 4268:2012 Radio equipment and systems: Short-range devices – Limits and methods of measurement.
- (2) More detailed information can be found in <http://www.anfr.fr> “TNRBF” and <http://www.arcep.fr/>.
- (3) See www.arcep.fr “PMSE”.
- (4) See www.arcep.fr “ARCEP” Decision N^o 2016-0272.
- (5) More detailed information can be found in the latest version of ARIB STD RCR STD-22.
- (6) The frequency range 470-710 MHz is used for Digital Terrestrial Television Broadcasting as a primary service and for wireless microphones as a secondary service. The channel arrangement and locations of wireless microphones are regulated by the Administration.
- (7) More detailed information can be found in the latest version of ARIB Standard STD-T112.
- (8) More detailed information can be found in RSS-123: <http://www.ic.gc.ca/eic/site/smt-gst.nsf/eng/sf10759.html>.
- (9) More detailed information can be found in <http://www.bundesnetzagentur.de/allgemeinzuteilungen> → “Mikrofone”.
- (10) More detailed information can be found in <http://www.bundesnetzagentur.de/drahtlosemikrofone> → “Funkmikrofone (Drahtlose Mikrofone)”.