International Telecommunication Union

ITU-R

Radiocommunication Sector of ITU

Recommendation ITU-R BT.1871

(03/2010)

User requirements for wireless microphones

BT Series

Broadcasting service (television)

Foreword

The role of the Radiocommunication Sector is to ensure the rational, equitable, efficient and economical use of the radio-frequency spectrum by all radiocommunication services, including satellite services, and carry out studies without limit of frequency range on the basis of which Recommendations are adopted.

The regulatory and policy functions of the Radiocommunication Sector are performed by World and Regional Radiocommunication Conferences and Radiocommunication Assemblies supported by Study Groups.

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Series of ITU-R Recommendations

(Also available online at http://www.itu.int/publ/R-REC/en)

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.*

Electronic Publication
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RECOMMENDATION ITU-R BT.1871*

User requirements for wireless microphones

(Question ITU-R 121/6)

(2009-2010)

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,

noting

a) that Report ITU-R BT.2069 – Spectrum usage and operational characteristics of terrestrial electronic news gathering (ENG), television outside broadcast (TVOB) and electronic field production (EFP) systems, provides specifications on analogue and digital wireless microphones,

* Radiocommunication Study Group 6 made editorial amendments to this Recommendation in May 2011.

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

Wireless microphone parameter data obtained from Report ITU-R BT.2069:

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	30 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 seeking to operate analogue and digital wireless microphones and when considerations are made to frequency sharing with other services.

Table 1 provides system parameters proposed for digital wireless microphone systems and Table 2 provides system parameters of analogue wireless microphone systems. Whilst, in practice, a range of operating parameters may be employed, these examples provide an indication of current system parameters.

Table 3 provides frequency bands and licensing arrangements within some administrations.

TABLE 1

Digital wireless microphone system parameters

Category	Specification
Applications	For concerts, conventions, and personal events at public halls, hotels, universities, schools, shopping malls, department stores, etc.
Communication system	Simplex, multicast and duplex
Maximum isotropic radiated power (e.i.r.p.)	10 mW (assuming 0 dBi antenna gain)
Tolerance of antenna input power	−50% to +20%
Symbol rate	128 ksymbol/s
Channel spacing	Nominally 125 kHz
Minimum operational channel spacing	(Simplex) 128 ksymbol/s: 375 kHz (Duplex) 128 ksymbol/s: 250 kHz
Adjacent channel power ratio	More than 40 dB
Occupied bandwidth	Within 250 kHz
Spurious emission into an adjacent channel	2.5 μW
Type of emission	F1D, F1E, F1W, F7D, F7E, F7W, G1D, G1E, G1W, G7D, G7E, G7W, D1D, D1E, D1W, D7D, D7E, D7W, A1D, A1E, A1W, A7D, A7E, A7W, N0N
Dynamic range	More than 96 dB
Audio frequency range	Up to 15 kHz
Maximum number of simultaneous operable channels at 4 MHz bandwidth	10 channels
Minimum operating distance between digital wireless microphone systems to avoid interference	30 m
Area placement by frequency interleaving	Yes (125-250 kHz)
Secured communication	Possible
Other transmitted information	Duplex control is possible

TABLE 2

Analogue wireless microphone system parameters

Category	Specification
Applications	For concerts, theatre, conventions, and personal events at public halls, hotels, universities, schools, shopping malls, department stores, etc.
Communication system	Simplex and multicast
Maximum isotropic radiated power (e.i.r.p.)	10 mW (assuming 0 dBi antenna gain)
Tolerance of antenna input power	−50% to +20%
Channel spacing	125 kHz
Minimum operational channel spacing	250 kHz
Adjacent channel power ratio	More than 60 dB
Occupied bandwidth	Within 125 kHz
Spurious emission level into adjacent channel	2.5 μW
Type of emission	F1D, F2D, F3E, F8W, F9W
Dynamic range	More than 96 dB
Audio frequency range	Up to 15 kHz
Maximum number of simultaneous operable channels at 4-8 MHz bandwidth	Typical 6 to 10 channels and 10 to 12 for high performance analogue
Minimum operating distance between analogue wireless microphone systems to avoid interference	180 m
Area placement by frequency interleaving	No
Secured communication	Impossible
Other transmitted information	Information to remote control from microphone

TABLE 3

Frequency bands and licensing arrangements

Country	Frequency tuning range	Licensing arrangement(s)
Australia	VHF Band III – 174-230 MHz	Class licence permits up to 3 mW e.i.r.p. at VHF and up to 100 mW e.i.r.p. at UHF 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/NZS4268[(1)] on short-range devices specifies 0.1 µW for spurious emission level into an adjacent channel
	UHF Bands IV/V – 520-694[(3)] MHz	
Japan[(5)]	40.68 MHz, 42.89 MHz	Maximum antenna input power: 10 mW (for analogue systems)
	44.87 MHz, 47.27 MHz	
	779.125-787.875 MHz	
	797.125-805.875 MHz	
	770.250-778.750 MHz	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	
	797.250-805.750 MHz	
France[(2)]	32.8 MHz, 36.4 MHz, 39.2 MHz	1 mW e.r.p. and BW 200 kHz (for analogue systems)
	169.4-169.6 MHz	500 mW e.r.p. and BW up to 50 kHz (for analogue systems)
	175.5-178.5 MHz	10 mW e.r.p. and BW up to 200 kHz (for analogue systems)
	183.5-186.5 MHz	10 mW e.r.p. and BW up to 200 kHz (for analogue systems)
	470-830 MHz[(3)]	[(2)]Limited to media professional uses
	863-865 MHz	SAB[(6)] (see Decisions ART[(7)] Nos. 99-781, 99-782 and 00-20) (for analogue systems)
	1 785-1 800 MHz[(4)]	10 mW (for analogue systems)
		20 mW e.r.p. (see Recommendation ERC/REC/70-03 (Annex 10)[(4)] Microphones)

TABLE 3 (*end*)

Country	Frequency tuning range	Licensing arrangement(s)
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
	740.000-752.000 MHz, 925.000-932.000 MHz	10 mW e.r.p. and BW up to 200 kHz

(1) AS/NZS 4268:2008 Radio equipment and systems: Short-range devices – Limits and methods of measurement.

(2) More detailed information can be found in:
http://www.anfr.fr/pages/tnrbf/A7.pdf and http://www.arcep.fr/.
Analogue and digital radio microphones comply with ETSI Standard EN 300 422 and frequencies allowed for analogue systems can be reused by digital systems.

(3) While the tuning range in the current Radiocommunications (Low Interference Potential Devices) Class Licence is 520-820 MHz, it will be reviewed as a consequence of the Australian government's decision on a UHF digital dividend in the range 694-820 MHz.

(4) http://www.erodocdb.dk/Docs/doc98/official/pdf/REC7003E.PDF

(5) More detailed information can be found in ARIB Standard RCR STD-22 V3.0 (2009-03).

(6) Services Ancillary to Broadcasting.

(7) Autorité de Régulations des Télécommunications.