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

# Policy on Intellectual Property Right (IPR)

ITU-R policy on IPR is described in the Common Patent Policy for ITU-T/ITU-R/ISO/IEC referenced in Annex 1 of Resolution ITU-R 1. Forms to be used for the submission of patent statements and licensing declarations by patent holders are available from <http://www.itu.int/ITU-R/go/patents/en> where the Guidelines for Implementation of the Common Patent Policy for ITU‑T/ITU‑R/ISO/IEC and the ITU-R patent information database can also be found.

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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 |

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| ***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

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| 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 µW 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 µW 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 µW for spurious emission level into an adjacent channel. |

TABLE 2 (*continued*)

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| 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*)

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| 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*)

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| Country | Frequency tuning range | Licensing arrangement(s) |
|  | 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. |
| United States of America | 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 |

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| (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](http://www.arcep.fr) “PMSE”.  (4) See [www.arcep.fr](http://www.arcep.fr) “ARCEP” Decision N0 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)”. |

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