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| **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.

# 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[[1]](#footnote-1)\*

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,

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. | | |

1. \* Radiocommunication Study Group 6 made editorial amendments to this Recommendation in May 2011. [↑](#footnote-ref-1)