

### Appendix 3

#### Table of Transmitter Frequency Tolerances

1. The frequency tolerance is expressed in parts in  $10^6$  or in hertz.
2. The power shown for the various categories of stations is the peak envelope power for single-sideband transmitters and the mean power for all other transmitters, unless otherwise indicated.
3. For technical and operational reasons, certain categories of stations may need more stringent tolerances than those shown in the table.

Frequency bands (lower limit exclusive, upper limit inclusive) and categories of stations	Tolerances applicable to transmitters
Band: 9 kHz to 535 kHz 1. Fixed stations: - 9 kHz to 50 kHz - 50 kHz to 535 kHz 2. Land stations: a. Coast stations b. Aeronautical stations 3. Mobil stations: a. Ship stations b. Ship's emergency transmitters c. Survival craft stations d. Aircraft stations 4. Radiodetermination stations 5. Broadcasting stations	   100 50  100 <sup>1)2)</sup> 100  200 <sup>3)4)</sup> 500 <sup>5)</sup> 500 100 100 10Hz
Band: 535 kHz to 1606.5 kHz Broadcasting Stations	10Hz <sup>6)</sup>
Band: 1606.5 kHz to 4 MHz 1. Fixed stations: - power 200 W or less - power above 200 W 2. Land stations: - power 200 W or less - power above 200 W 3. Mobil stations: a. Ship stations b. Survival craft stations c. Emergency position-indicating radiobeacons d. Aircraft stations	   100 <sup>7)8)</sup> 50 <sup>7)8)</sup>  100 <sup>1)2)7)9)10)</sup> 50 <sup>1)2)7)9)10)</sup>  40Hz <sup>3)4)11)</sup> 100 100 100 <sup>10)</sup>

Frequency bands (lower limit exclusive, upper limit inclusive) and categories of stations	Tolerances applicable to transmitters
<ul style="list-style-type: none"> <li>e. Land mobile stations</li> <li>4. Radiodetermination stations: <ul style="list-style-type: none"> <li>- power 200 W or less</li> <li>- power above 200 W</li> </ul> </li> <li>5. Broadcasting station</li> </ul>	<ul style="list-style-type: none"> <li>50 <sup>12)</sup></li> <li>20 <sup>13)</sup></li> <li>10 <sup>13)</sup></li> <li>10Hz <sup>14)</sup></li> </ul>
<p>Band: 4 MHz to 29.7 MHz</p> <ul style="list-style-type: none"> <li>1. Fixed stations: <ul style="list-style-type: none"> <li>a. Single- sideband and independent- sideband emissions: <ul style="list-style-type: none"> <li>- power 500 W or less</li> <li>- power above 500 W</li> </ul> </li> <li>b. Class F1B emissions</li> <li>c. Other classes of emission: <ul style="list-style-type: none"> <li>- power 500 W or less</li> <li>- power above 500 W</li> </ul> </li> </ul> </li> <li>2. Land stations: <ul style="list-style-type: none"> <li>a. Coast stations</li> <li>b. Aeronautical stations: <ul style="list-style-type: none"> <li>- power 500 W or less</li> <li>- power above 500 W</li> </ul> </li> <li>c. Base stations: <ul style="list-style-type: none"> <li>- power 500 W or less</li> <li>- power above 500 W</li> </ul> </li> </ul> </li> <li>3. Mobil stations: <ul style="list-style-type: none"> <li>a. Ship stations: <ul style="list-style-type: none"> <li>1) Class A1A emissions</li> <li>2) Emissions other than class A1A</li> </ul> </li> <li>b. Survival craft stations</li> <li>c. Aircraft stations</li> <li>d. Land mobile stations</li> </ul> </li> <li>4. Broadcasting stations</li> <li>5. Space stations</li> <li>6. Earth Stations</li> </ul>	<ul style="list-style-type: none"> <li>50Hz</li> <li>20Hz</li> <li>10Hz</li> <li>20</li> <li>10</li> <li>20Hz <sup>1)2)15)</sup></li> <li>100 <sup>10)</sup></li> <li>50 <sup>10)</sup></li> <li>20 <sup>7)</sup></li> <li>10</li> <li>50Hz <sup>3)4)16)</sup></li> <li>50</li> <li>100 <sup>10)</sup></li> <li>40 <sup>17)</sup></li> <li>10Hz <sup>14)18)</sup></li> <li>20</li> <li>20</li> </ul>
<p>Band: 29.7 MHz to 100 MHz</p> <ul style="list-style-type: none"> <li>1. Fixed stations: <ul style="list-style-type: none"> <li>- power 50 W or less</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>30</li> </ul>

Frequency bands (lower limit exclusive, upper limit inclusive) and categories of stations	Tolerances applicable to transmitters
<ul style="list-style-type: none"> <li>- power above 50 W</li> <li>2. Land stations</li> <li>3. Mobile stations</li> <li>4. Radiotermination stations</li> <li>5. Broadcasting stations (other than television)</li> <li>6. Broadcasting stations (television sound and vision)</li> <li>7. Space stations</li> <li>8. Earth stations</li> </ul>	<ul style="list-style-type: none"> <li>20</li> <li>20</li> <li>20 <sup>19)</sup></li> <li>50</li> <li>2000Hz <sup>20)</sup></li> <li>500Hz <sup>21)22)</sup></li> <li>20</li> <li>20</li> </ul>
<p>Band: 100 MHz to 470 MHz</p> <ul style="list-style-type: none"> <li>1. Fixed stations: <ul style="list-style-type: none"> <li>- power 50 W or less</li> <li>- power above 50 W</li> </ul> </li> <li>2. Land stations: <ul style="list-style-type: none"> <li>a. Coast stations</li> <li>b. Aeronautical stations</li> <li>c. Base stations: <ul style="list-style-type: none"> <li>- in the band 100-235 MHz</li> <li>- in the band 235-401 MHz</li> <li>- in the band 401-470 MHz</li> </ul> </li> </ul> </li> <li>3. Mobile Stations: <ul style="list-style-type: none"> <li>a. Ship stations and survival craft stations: <ul style="list-style-type: none"> <li>- in the band 156-174 MHz</li> <li>- outside the band 156-174 MHz</li> </ul> </li> <li>b. Aircraft stations</li> <li>c. Land mobile stations: <ul style="list-style-type: none"> <li>- in the band 100-235 MHz</li> <li>- in the band 235-401 MHz</li> <li>- in the band 401-470 MHz</li> </ul> </li> </ul> </li> <li>4. Radiodetermination stations</li> <li>5. Broadcasting stations (other than television)</li> <li>6. Broadcasting stations (television sound and vision)</li> <li>7. Space stations</li> <li>8. Earth stations</li> </ul>	<ul style="list-style-type: none"> <li>20 <sup>23)</sup></li> <li>10</li> <li>10</li> <li>20 <sup>24)</sup></li> <li>15 <sup>25)</sup></li> <li>7 <sup>25)</sup></li> <li>5 <sup>25)</sup></li> <li>10</li> <li>50 <sup>26)</sup></li> <li>30 <sup>24)</sup></li> <li>15 <sup>25)</sup></li> <li>7 <sup>25)27)</sup></li> <li>5 <sup>25)27)</sup></li> <li>50 <sup>28)</sup></li> <li>2000Hz <sup>20)</sup></li> <li>500Hz <sup>21)22)</sup></li> <li>20</li> <li>20</li> </ul>
<p>Band: 470 MHz to 2.45 GHz</p>	

Frequency bands (lower limit exclusive, upper limit inclusive) and categories of stations	Tolerances applicable to transmitters
1. Fixed stations: - power 100 W or less - power above 100 W 2. Land stations 3. Mobile stations 4. Radiodetermination stations 5. Broadcasting stations (other than television) 6. Broadcasting stations (television sound and vision) in the band 470 to 960 MHz 7. Space stations 8. Earth stations	100 50 20 <sup>29)</sup> 20 <sup>29)</sup> 500 <sup>28)</sup> 100 500Hz <sup>21)22)</sup> 20 20
Band: 2.45 GHz to 10.5 GHz 1. Fixed stations: - power 100 W or less - power above 100 W 2. Land stations 3. Mobile stations 4. Radiodetermination stations 5. Space stations 6. Earth stations	200 50 100 100 1250 <sup>28)</sup> 50 50
Band: 10.5 GHz to 40 GHz 1. Fixed stations 2. Radiodetermination stations 3. Broadcasting stations 4. Space stations 5. Earth stations	300 5000 <sup>28)</sup> 100 100 100

Notes in the Table of Transmitter Frequency Tolerances:

- 1) For coast station transmitters used for direct-printing telegraphy or for data transmission, the tolerance is:
  - 5 Hz for narrow-band phase shift keying;
  - 15 Hz for frequency-shift keying for transmitters in use or installed before 2 January 1992;
  - 10 Hz for frequency-shift keying for transmitters installed after 1 January 1992.
- 2) For coast station transmitters used for digital selective calling, the tolerance is 10 Hz.
- 3) For ship station transmitters used for direct-printing telegraphy or for data transmission, the tolerance is:
  - 5 Hz for narrow-band phase-shift keying;
  - 40 Hz for frequency-shift keying for transmitters in use or installed before 2 January 1992.

- 10 Hz for frequency-shift keying for transmitters installed after 1 January 1992.
- 4) For ship station transmitters used for digital selective calling, the tolerance is 10 Hz.
- 5) If the emergency transmitter is used as the reserve transmitter for the main transmitter, the tolerance for ship station transmitters applies.
- 6) In countries covered by the North America Regional Broadcasting Agreement (NARBA) the tolerance of 20 Hz may continue to be applied.
- 7) For single- sideband radiotelephone transmitters except at coast stations, the tolerance is:
  - 50 Hz in the bands 1606.5 (1605 Region 2) - 4000 kHz and 4-29.7 MHz, for peak envelope powers of 200 W or less and 500 W or less, respectively;
  - 20 Hz in the bands 1606.5 (1605 Region 2) - 4000 kHz and 4-29.7 MHz, for peak envelope powers above 200 W and 500 W, respectively.
- 8) For radiotelegraphy transmitters which frequency-shift keying the tolerance is 10 Hz.
- 9) For coast station single-sideband radiotelephone transmitters the tolerance is 20 Hz.
- 10) For single-sideband transmitters operating in the frequency bands 1606.5-4000 kHz and 4-29.7 MHz which are allocated exclusively to the aeronautical mobile (R) service, the tolerance on the carrier (reference) frequency is:
  - a. for all aeronautical stations, 10 Hz;
  - b. for all aircraft stations operating on international services, 20 Hz;
  - c. for aircraft stations operating exclusively on national services, 50 Hz.
- 11) For A1A emissions the tolerance is  $50 \times 10^{-6}$ .
- 12) For transmitters used for single-sideband radiotelephony or for frequency-shift keying radiotelegraphy the tolerance is 40 Hz.
- 13) For radiobeacon transmitters in the band 1606.5 -1800 kHz the tolerance is  $50 \times 10^{-6}$ .
- 14) For A3E emissions with carrier power of 10 kW or less the tolerance is  $20 \times 10^{-6}$ ,  $15 \times 10^{-6}$  and  $10 \times 10^{-6}$  in the bands 1606.5 (1605 Region 2)-4000 kHz, 4-5.95 MHz and 5.95-29.7 MHz respectively.
- 15) For A1A emissions the tolerance is  $10 \times 10^{-6}$ .
- 16) For ship station transmitters in the band 26175-27500 kHz, on board small craft, with a carrier power not exceeding 5 W in or near coastal waters and utilizing F3E and G3E emissions, the frequency tolerance is  $40 \times 10^{-6}$ .
- 17) The tolerance is 50 Hz for single-sideband radiotelephone transmitters, except for those transmitters operating in the band 26175-27500 kHz, and not exceeding a peak envelop power of 15 W, for which the basic tolerance of  $40 \times 10^{-6}$  applies.
- 18) It is suggested that administrations avoid carrier frequency differences of a few hertz, which cause degradations similar to periodic fading. This could be avoided if the frequency tolerance were 0.1 Hz, a tolerance which would be suitable for single-sideband emissions.
- 19) For non-vehicular portable equipment with a transmitter mean power not exceeding 5 W, the tolerance is  $40 \times 10^{-6}$ .
- 20) For transmitters of a mean power of 50 W or less operating at frequencies below 108 MHz a tolerance of 3000 Hz applies.
- 21) In the case of television stations of:
  - 50 W (vision peak envelope power) or less in the band 29.7-100 MHz;
  - 100 W (vision peak envelope power) or less in the band 100-960 MHz;
 and which receive their input from other television stations or which serve small isolated communities, it may not, for operational reasons, be possible to maintain this tolerance. For such stations, the tolerance is 2000 Hz.  
 For stations of 1 W (vision peak envelope power) or less this tolerance may be relaxed further to:
  - 5 kHz in the band 100-470 MHz;
  - 10 kHz in the band 470-960 MHz.

- 22) For transmitters for system M ( NTSC ) the tolerance is 1000 Hz. However, for low power transmitters using this system Note 21) applies.
- 23) For multi-hop radio-relay systems employing direct frequency conversion the tolerance is  $30 \times 10^{-6}$ .
- 24) For a channel spacing of 50 kHz the tolerance is  $50 \times 10^{-6}$ .
- 25) These tolerances apply to channel spacings equal to or greater than 20 kHz.
- 26) For transmitters used by on-board communication stations a tolerance of  $5 \times 10^{-6}$  shall apply.
- 27) For non-vehicular mounted portable equipment with a transmitter mean power not exceeding 5 W the tolerance is  $15 \times 10^{-6}$ .
- 28) Where specific frequencies are not assigned to radar stations, the bandwidth occupied by the emissions of such stations shall be maintained wholly within the band allocated to the service and the indicated tolerance does not apply.
- 29) In applying this tolerance administrations should be guided by the latest relevant CCIR Recommendations.