

## Appendix 3

### Table of Transmitter Frequency Tolerance

1. The frequency tolerance is expressed in parts in  $10^6$  (ppm) or in hertz (Hz).
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 tolerance than those shown in the table.

Frequency bands (lower limit exclusive, upper limit inclusive) and categories of stations	Tolerance applicable to transmitters
Bandwidth: 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. Mobile stations: a. Ship stations b. Ship emergency transmitters c. Survival craft stations d. Aircraft stations 4. Radiodetermination stations 5. Broadcasting Stations	100 ppm 50 ppm 100 ppm (1)(2) 100 ppm 200 ppm (3)(4) 500 ppm (5) 500 ppm 100 ppm 100 ppm 10 Hz
Bandwidth: 535 kHz to 1606.5 kHz Broadcasting Stations	10 Hz (6)
Bandwidth: 1.6065 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. Mobile stations: a. Ship stations b. Survival craft stations c. Emergency position-indicating radio beacons d. Aircraft stations e. Land mobile stations	100 ppm(7)(8) 50 ppm (7)(8) 100 ppm (1)(2)(7)(9)(10) 50 ppm(1)(2)(7)(9)(10) 40 Hz (3)(4)(11) 100 ppm 100 ppm 100 ppm(10) 50 ppm (12)

4. Radiodetermination stations <ul style="list-style-type: none"> <li>— power 200 W or less</li> <li>— power above 200 W</li> </ul> 5. Broadcasting Stations	20 ppm(13) 10 ppm (13) 10 Hz (14)
Bandwidth: 4 MHz to 29.7 MHz 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. Emissions of other classes <ul style="list-style-type: none"> <li>— power 500 W or less</li> <li>— power above 500 W</li> </ul> </li> </ul> 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> 3. Mobile 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 of classes 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> 4. Broadcasting Stations 5. Space stations 6. Earth stations	50 Hz 20 Hz 10 Hz  20 ppm 10 ppm  20 Hz (1)(2)(15)  100 ppm (10) 50 ppm (10) 20 ppm(7)  10 ppm 50 Hz (3)(4)(16)  50 ppm 100 ppm (10) 40 ppm (17) 10 Hz (14)(18) 20 ppm 20 ppm
Bandwidth: 29.7 MHz to 100 MHz 1. Fixed stations: <ul style="list-style-type: none"> <li>— power 50 W or less</li> <li>— power above 50 W</li> </ul> 2. Land stations: 3. Mobile stations: 4. Radiodetermination stations 5. Broadcasting Stations (other than television) : 6. Broadcasting Stations (television sound and	30 ppm 20 ppm 20 ppm 20 ppm (19) 50 ppm 2000 Hz (20) 500 Hz (21)(22)

vision) :	
7. Space stations	20 ppm
8. Earth stations	20 ppm
Bandwidth: 100 MHz to 470 MHz	
1. Fixed stations:	
— power 50 W or less	20 ppm (23)
— power above 500 W	10 ppm
2. Land stations:	
a. Coast stations	10 ppm
b. Aeronautical stations	20 ppm (24)
c. Base stations:	
— in the band 100 MHz to 235 MHz	15 ppm (25)
— in the band 235 MHz to 401 MHz	7 ppm (25)
— in the band 401 MHz to 470 MHz	5 ppm (25)
3. Mobile stations:	
a. Ship stations and survival craft stations:	
— in the band 156 MHz to 174 MHz	10 ppm
— outside the band 156 MHz to 174 MHz	50 ppm (26)
b. Aircraft stations	30 ppm (24)
c. Land mobile stations	
— in the band 100 MHz to 235 MHz	15 ppm (25)
— in the band 235 MHz to 401 MHz	7 ppm (25)(27)
— in the band 401 MHz to 470 MHz	5 ppm (25)(27)
4. Radiodetermination stations	50 ppm (28)
5. Broadcasting Stations (other than television)	2000 Hz (20)
6. Broadcasting Stations (television sound and vision) :	500 Hz (21)(22)
7. Space stations	20 ppm
8. Earth stations	20 ppm
Bandwidth: 470 MHz to 2.45 GHz	
1. Fixed stations:	
— power 100 W or less	100 ppm
— power above 100 W	50 ppm
2. Land stations	20 ppm (29)
3. Mobile stations	20 ppm (29)
4. Radiodetermination stations	500 ppm (28)
5. Broadcasting Stations (other than television)	100 ppm
6. Broadcasting Stations (television sound and vision) :	
7. Space stations	500 Hz (21)(22)
8. Earth stations	20 ppm
	20 ppm

Bandwidth: 2.45 G Hz to 10.5 G Hz 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 ppm 50 ppm 100 ppm 100 ppm 1250 ppm (28) 50 ppm 50 ppm
Bandwidth: 10.5 G Hz to 40 G Hz 1. Fixed stations 2. Radiodetermination stations 3. Broadcasting Stations 4. Space stations 5. Earth stations	300 ppm 5000 ppm (28) 100 ppm 100 ppm 100 ppm

Notes in the Table of Transmitter Frequency Tolerance:

- (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 January 2, 1992;
  - 10 Hz for frequency-shift keying for transmitters installed after January 1, 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 January 2, 1992;
  - 10 Hz for frequency-shift keying for transmitters installed after January 1, 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) to 4000 kHz and 4 MHz to 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) to 4000 kHz and 4 MHz to 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 kHz to 4000 kHz; and 4 MHz to 29.7 MHz, which are allocated exclusively to the aeronautical mobile(R) service, the tolerance on the carrier (reference) frequency is:
- for all aeronautical stations, 10 Hz;
  - for all aircraft stations operating on international services, 20 Hz;
  - 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 radio beacon transmitters in the band 1606.5 kHz to 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 kHz (1605 Region 2) to 4000 kHz; 4 MHz to 5.95 MHz; and 5.95 MHz to 29.7 MHz, respectively.
- (15) For A1A emissions the tolerance is  $10 \times 10^{-6}$ .
- (16) For ship station transmitters in the band 2.6175 MHz to 2.75 MHz, 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 2.6175 MHz to 2.75 MHz, 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 the competent authority shall 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-side
- (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 3 kHz applies.
- (21) In the case of television stations of:
- 50 W or less in the band 29.7 MHz to 100 MHz;
  - 100 W (vision peak envelope power) or less in the band 100 MHz to 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 2 kHz.
- For stations of 1 W (vision peak envelope power) or less, this tolerance may be relaxed further to:
- 5 kHz in the band 100 MHz to 470 MHz;
  - 10 kHz in the band 470 MHz to 960 MHz.
- (22) For transmitters for system M (NTSC), the tolerance is 1 kHz. 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 competent authority should be guided by the latest relevant CCIR Recommendations.