RECOMMENDATION ITU-R M.1581-2*,

Generic unwanted emission characteristics of mobile stations using the terrestrial radio interfaces of IMT-2000

(Question ITU-R 229/8)

(2002-2003-2007)

Scope

This Recommendation provides the generic unwanted emission characteristics of mobile stations using the terrestrial radio interfaces of IMT-2000.

The ITU Radiocommunication Assembly,

considering

a) that unwanted emissions consist of both spurious and out-of-band (OoB) emissions according to No. 1.146 of the Radio Regulations (RR) and that spurious and OoB emissions are defined in RR Nos. 1.145 and 1.144, respectively;

b) that limitation of the maximum permitted levels of unwanted emissions of IMT-2000 mobile stations (MSs) is necessary to protect other radio systems and services from interference and to enable coexistence between different technologies;

c) that too stringent limits may lead to an increase in size or in complexity of IMT-2000 radio equipment;

d) that every effort should be made to keep limits for unwanted emissions at the lowest possible values taking account of economic factors and technological limitations;

e) that Recommendation ITU-R SM.329 relates to the effects, measurements and limits to be applied to spurious domain emissions;

f) that the same spurious emission limits apply equally to MSs of all radio interfaces;

g) that Recommendation ITU-R SM.1541 relating to OoB emission specifies generic limits in the OoB domain which generally constitute the least restrictive OoB emission limits and encourages the development of more specific limits for each system;

h) that the levels of spurious emissions of IMT-2000 terminals shall comply with the limits specified in RR Appendix 3;

j) that Recommendation ITU-R M.1574 establishes the technical basis for global circulation of IMT-2000 MSs;

k) that one of the basic requirements of global circulation is that the MS does not cause harmful interference in any country where it is taken;

l) that the harmonization of unwanted emission limits will facilitate global use and access to a global market;

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* This Recommendation should be brought to the attention of Radiocommunication Study Group 1.

m) that additional work is needed in order to define unwanted emission limits for equipment operating in the bands identified for IMT-2000 at the World Radiocommunication Conference (Istanbul, 2000) (WRC-2000);n) that unwanted emission limits are dependent on the transmitter emission characteristics in addition to depending on services operating in other bands,

noting

a) the work carried out by standardization bodies to define limits to protect other radio systems and services from interference and to enable coexistence between different technologies;

b) that IMT-2000 mobile stations must comply with local, regional, and international regulations for out-of-band and spurious emissions relevant to their operations, wherever such regulations apply;

c) with regard to Annex 6, IMT-2000 OFDMA TDD WMAN, additional urgent work, in particular on emission mask and ACLR, is needed to ensure geographical coexistence with other IMT-2000 radio interfaces,

recommends

1 that the unwanted emission characteristics of IMT-2000 MSs should be based on the limits contained in the technology specific Annexes 1 to 6 which correspond to the radio interface specifications described in § 5.1 to 5.6 of Recommendation ITU-R M.1457.

NOTE 1 – Except the cases stated in Note 2 or Note 3, the unwanted emission limits are only defined for mobile stations operating according to the following arrangement: frequency division duplex (FDD) uplink in the band 1 920-1 980 MHz, FDD downlink in the band 2 110-2 170 MHz and time division duplex (TDD) in the bands 1 885-1 980 and 2 010-2 025 MHz. Future versions of this Recommendation will include limits applicable to other frequency bands. Subject to further study, it is anticipated that such limits would be similar to those already contained in this Recommendation.

NOTE 2 – The unwanted emission limits defined in Annex 1 are for MS operating one of or a combination of the following arrangements:

- Frequency division duplex (FDD) uplink in the band 1 920-1 980 MHz, FDD downlink in the band 2 110-2 170 MHz, in Annex 1 referred to as FDD Band I.
- FDD uplink in the band 1 850-1 910 MHz, FDD downlink in the band 1 930-1 990 MHz, in Annex 1 referred to as FDD Band II.
- FDD uplink in the band 1 710-1 785 MHz, FDD downlink in the band 1 805-1 880 MHz, in Annex 1 referred to as FDD Band III.
- FDD uplink in the band 1 710-1 755 MHz, FDD downlink in the band 2 110-2 155 MHz, in Annex 1 referred to as FDD Band IV.
- FDD uplink in the band 824-849 MHz, FDD downlink in the band 869-894 MHz, in Annex 1 referred to as FDD Band V.
- FDD uplink in the band 830-840 MHz, FDD downlink in the band 875-885 MHz, in Annex 1 referred to as FDD Band VI.
- FDD uplink in the band 2 500-2 570 MHz, FDD downlink in the band 2 620-2 690 MHz, in Annex 1 referred to as FDD Band VII.
- FDD uplink in the band 880-915 MHz, FDD downlink in the band 925-960 MHz, in Annex 1 referred to as FDD Band VIII.
- FDD uplink in the band 1 749.9-1 784.9 MHz, FDD downlink in the band 1 844.9-1 879.9 MHz, in Annex 1 referred to as FDD Band IX.

– FDD uplink in the band 1 710-1 770 MHz, FDD downlink in the band 2 110-2 170 MHz, in Annex 1 referred to as FDD Band X.

Future versions of this Recommendation will include limits applicable to other frequency bands. Subject to further study, it is anticipated that such limits would be similar to those already contained in this Recommendation.

NOTE 3 – The unwanted emission limits defined in Annex 3 are for MS operating one of, or a combination of, the following arrangements:

– Time division duplex (TDD) in the band 1 900-1 920 MHz and 2 010-2 025 MHz.

– TDD in the band 1 850-1 910 MHz and 1 930-1 990 MHz.

– TDD in the band 1 910-1 930 MHz.

– TDD in the band 2 570-2 620 MHz.

Future versions of this Recommendation will include limits applicable to other frequency bands. Subject to further study, it is anticipated that such limits would be similar to those already contained in this Recommendation.

NOTE 4 – The out-of-band emission limits defined in Annex 6 are for MS operating in the following arrangement:

– TDD in the band 2 500-2 690 MHz

Annexes

Annex 1 – IMT-2000 CDMA Direct Spread (universal terrestrial radio access (UTRA) FDD) mobile stations

Annex 2 – IMT-2000 CDMA Multi-Carrier (CDMA-2000) mobile stations

Annex 3 – IMT-2000 CDMA TDD (UTRA TDD)mobile stations

Annex 4 – IMT-2000 TDMA Single-Carrier (UWC-136) mobile stations

Annex 5 – IMT-2000 FDMA/TDMA (digital enhanced cordless telecommunications (ECT)) mobile stations

Annex 6 – IMT-2000 OFDMA TDD WMAN mobile stations

Annex 1

CDMA Direct Spread (universal terrestrial radio access (UTRA) FDD) mobile stations

1 Measurement uncertainty

Values specified in this Annex differ from those specified in Recommendation ITU-R M.1457 since values in this Annex incorporate test tolerances defined in Recommendation ITU-R M.1545.

2 Spectrum mask

The spectrum emission mask of the MS applies to frequencies, which are between 2.5 MHz and 12.5 MHz away from the MS centre carrier frequency. The out-of-channel emission is specified relative to the root raised cosine (RRC) filtered mean power of the UE carrier, where the RRC filtered mean power is the mean power measured through a root raised cosine filter with a roll-off factor of 0.22 and a bandwidth equal to the chip rate of 3.84 MHz. The power of any UE emission should not exceed the levels specified in Table 1.

The absolute requirement is based on a −48.5 dBm/3.84 MHz minimum power threshold for the UE. This limit is expressed for the narrower measurement bandwidths as −54.3 dBm/1 MHz and −69.6 dBm/30 kHz.

TABLE 1

Spectrum emission mask requirement (UTRA FDD MS)

Δf in MHz (Note 1)	**Minimum requirement (Note 2)**		**Additional requirements Band II, Band IV and Band V (Note 3)**	**Measurement bandwidth (Note 6)**
	Relative requirement	**Absolute requirement (in measurement bandwidth)**		
2.5-3.5	$\left\{-33.5-15\cdot\left(\frac{\Delta f}{\text{MHz}}-2.5\right)\right\}$ dBc	−69.6 dBm	−15 dBm	30 kHz (Note 4)
3.5-7.5	$\left\{-33.5-1\cdot\left(\frac{\Delta f}{\text{MHz}}-3.5\right)\right\}$ dBc	−54.3 dBm	−13 dBm	1 MHz (Note 5)
7.5-8.5	$\left\{-37.5-10\cdot\left(\frac{\Delta f}{\text{MHz}}-7.5\right)\right\}$ dBc	−54.3 dBm	−13 dBm	1 MHz (Note 5)
8.5-12.5	−47.5 dBc	−54.3 dBm	−13 dBm	1 MHz (Note 5)

NOTE 1 – Δf is the separation between the carrier frequency and the centre of the measurement bandwidth.

NOTE 2 – The minimum requirement is calculated from the relative requirement or the absolute requirement, whichever is the higher power.

NOTE 3 – For operation in Band II, Band IV and Band V only, the minimum requirement is calculated from the minimum requirement calculated in Note 2 or the additional requirement for Band II, whichever is the lower power.

NOTE 4 – The first and last measurement positions with a 30 kHz filter at Δf equals 2.515 MHz and 3.485 MHz.

NOTE 5 – The first and last measurement positions with a 1 MHz filter at Δf equals 4 MHz and 12 MHz.

NOTE 6 – As a general rule, the resolution bandwidth of the measuring equipment should be equal to the measurement bandwidth. However, to improve measurement accuracy, sensitivity and efficiency, the resolution bandwidth may be smaller than the measurement bandwidth. When the resolution bandwidth is smaller than the measurement bandwidth, the result should be integrated over the measurement bandwidth in order to obtain the equivalent noise bandwidth of the measurement bandwidth.

3 Adjacent channel leakage power ratio (ACLR)

ACLR is the ratio of the RRC filtered mean power centred on the assigned channel frequency to the RRC filtered mean power centred on an adjacent channel frequency.

The limit for ACLR should be as specified in Table 2.

TABLE 2

MS ACLR limits

MS channel offset below the first or above the last carrier frequency used (MHz)	ACLR limit (dB)
5	32.2
10	42.2

4 Transmitter spurious emissions (conducted)

The limits shown in Tables 3 and 4 are only applicable for frequencies which are greater than 12.5 MHz away from the MS centre carrier frequency.

TABLE 3

General spurious emissions requirements

Frequency bandwidth	Measurement bandwidth	Minimum requirement (dBm)
9 kHz $\leq f <$ 150 kHz	1 kHz	–36
150 kHz $\leq f <$ 30 MHz	10 kHz	–36
30 MHz $\leq f <$ 1 000 MHz	100 kHz	–36
1 GHz $\leq f <$ 12.75 GHz	1 MHz	–30

TABLE 4

Additional spurious emissions requirements

Operating Band	Frequency bandwidth	Measurement bandwidth	Minimum requirement
I	860 MHz ≤ f ≤ 895 MHz	3.84 MHz	−60 dBm
	921 MHz ≤ f < 925 MHz	100 kHz	−60 dBm (see Note 1)
	925 MHz ≤ f ≤ 935 MHz	100 kHz 3.84 MHz	−67 dBm (see Note 1) −60 dBm
	935 MHz < f ≤ 960 MHz	100 kHz	−79 dBm (see Note 1)
	1 805 MHz ≤ f ≤ 1 880 MHz	100 kHz	−71 dBm (see Note 1)
	1 844.9 MHz ≤ f ≤ 1 879.9 MHz	3.84 MHz	−60 dBm
	1 884.5 MHz < f < 1 919.6 MHz	300 kHz	−41 dBm
	2 110 MHz ≤ f ≤ 2 170 MHz	3.84 MHz	−60 dBm
	2 620 MHz ≤ f ≤ 2 690 MHz	3.84 MHz	−60 dBm
II	869 MHz ≤ f ≤ 894 MHz	3.84 MHz	−60 dBm
	1 930 MHz ≤ f ≤ 1 990 MHz	3.84 MHz	−60 dBm
	2 110 MHz ≤ f ≤ 2 155 MHz	3.84 MHz	−60 dBm
	2 110 MHz ≤ f ≤ 2 170 MHz	3.84 MHz	−60 dBm
III	921 MHz ≤ f < 925 MHz	100 kHz	−60 dBm (see Note 1)
	925 MHz ≤ f ≤ 935 MHz	100 kHz 3.84 MHz	−67 dBm (see Note 1) −60 dBm
	935 MHz < f ≤ 960 MHz	100 kHz	−79 dBm (see Note 1)
	1 805 MHz ≤ f ≤ 1 880 MHz	3.84 MHz	−60 dBm
	2 110 MHz ≤ f ≤ 2 170 MHz	3.84 MHz	−60 dBm
	2 620 MHz ≤ f ≤ 2 690 MHz	3.84 MHz	−60 dBm
IV	869 MHz ≤ f ≤ 894 MHz	3.84 MHz	−60 dBm
	1 930 MHz ≤ f ≤ 1 990 MHz	3.84 MHz	−60 dBm
	2 110 MHz ≤ f ≤ 2 155 MHz	3.84 MHz	−60 dBm
	2 110 MHz ≤ f ≤ 2 170 MHz	3.84 MHz	−60 dBm
V	869 MHz ≤ f ≤ 894 MHz	3.84 MHz	−60 dBm
	1 930 MHz ≤ f ≤ 1 990 MHz	3.84 MHz	−60 dBm
	2 110 MHz ≤ f ≤ 2 155 MHz	3.84 MHz	−60 dBm
	2 110 MHz ≤ f ≤ 2 170 MHz	3.84 MHz	−60 dBm
VI	860 MHz ≤ f < 875 MHz	1 MHz	−37 dBm
	875 MHz ≤ f ≤ 895 MHz	3.84 MHz	−60 dBm
	1 844.9 MHz ≤ f ≤ 1 879.9 MHz	3.84 MHz	−60 dBm
	1 884.5 MHz ≤ f ≤ 1 919.6 MHz	300 kHz	−41 dBm
	2 110 MHz ≤ f ≤ 2 170 MHz	3.84 MHz	−60 dBm

TABLE 4 (*end*)

Operating Band	Frequency bandwidth	Measurement bandwidth	Minimum requirement
VII	921 MHz ≤ f < 925 MHz	100 kHz	−60 dBm (see Note 1)
	925 MHz ≤ f ≤ 935 MHz	100 kHz 3.84 MHz	−67 dBm (see Note 1) −60 dBm
	935 MHz < f ≤ 960 MHz	100 kHz	−79 dBm (see Note 1)
	1 805 MHz ≤ f ≤ 1 880 MHz	100 kHz	−71 dBm (see Note 1)
	2 110 MHz ≤ f ≤ 2 170 MHz	3.84 MHz	−60 dBm
	2 620 MHz ≤ f ≤ 2 690 MHz	3.84 MHz	−60 dBm
	2 590 MHz ≤ f ≤ 2 620 MHz	3.84 MHz	−50 dBm
VIII	925 MHz ≤ f ≤ 935 MHz	100 kHz 3.84 MHz	−67 dBm (see Note 1) −60 dBm
	935 MHz < f ≤ 960 MHz	100 kHz 3.84 MHz	−79 dBm (see Note 1) −60 dBm
	1 805 MHz < f ≤ 1 830 MHz	100 kHz 3.84 MHz	−71 dBm (see Notes 1 and 2) −60 dBm (see Note 2)
	1 830 MHz < f ≤ 1 880 MHz	100 kHz 3.84 MHz	−71 dBm (see Note 1) −60 dBm
	2 110 MHz ≤ f ≤ 2 170 MHz	3.84 MHz	−60 dBm
	2 620 MHz ≤ f ≤ 2 640 MHz	3.84 MHz	−60 dBm
	2 640 MHz < f ≤ 2 690 MHz	3.84 MHz	−60 dBm (see Note 2)
IX	860 MHz ≤ f ≤ 895 MHz	3.84 MHz	−60 dBm
	1 844.9 MHz ≤ f ≤ 1 879.9 MHz	3.84 MHz	−60 dBm
	1 884.5 MHz ≤ f ≤ 1 919.6 MHz	300 kHz	−41 dBm
	2 110 MHz ≤ f ≤ 2 170 MHz	3.84 MHz	−60 dBm
X	869 MHz ≤ f ≤ 894 MHz	3.84 MHz	−60 dBm
	1 930 MHz ≤ f ≤ 1 990 MHz	3.84 MHz	−60 dBm
	2 110 MHz ≤ f ≤ 2 170 MHz	3.84 MHz	−60 dBm

NOTE 1 – The measurements are made on frequencies which are integer multiples of 200 kHz. As exceptions, up to five measurements with a level up to the applicable requirements defined in Table 3 are permitted for each channel used in the measurement.

NOTE 2 – The measurements are made on frequencies which are integer multiples of 200 kHz. As exceptions, measurements with a level up to the applicable requirements defined in Table 3 are permitted for each channel used in the measurement due to second or third harmonic spurious emissions.

5 Receiver spurious emissions (conducted)

The power of any narrow-band continuous wave (CW) spurious emission should not exceed the maximum level specified in Tables 5 and 6.

TABLE 5

General receiver spurious emission requirements

Frequency band	Measurement bandwidth	Maximum level	Note
30 MHz ≤ f < 1 GHz	100 kHz	−57 (dBm)	
1 GHz ≤ f ≤ 12.75 GHz	1 MHz	−47 (dBm)	

TABLE 6

Additional receiver spurious emission requirements

Band	Frequency band	Measurement bandwidth	Maximum level	Note
I	860 MHz ≤ f ≤ 895 MHz	3.84 MHz	−60 dBm	
	921 MHz ≤ f < 925 MHz	100 kHz	−60 dBm*	
	925 MHz ≤ f ≤ 935 MHz	100 kHz 3.84 MHz	−67 dBm* −60 dBm	
	935 MHz < f ≤ 960 MHz	100 kHz	−79 dBm*	
	1 805 MHz ≤ f ≤ 1 880 MHz	100 kHz	−71 dBm*	
	1 844.9 MHz ≤ f ≤ 1 879.9 MHz	3.84 MHz	−60 dBm	
	1 920 MHz ≤ f ≤ 1 980 MHz	3.84 MHz	−60 dBm	UE transmit band in URA_PCH, Cell_PCH and idle state
	2 110 MHz ≤ f ≤ 2 170 MHz	3.84 MHz	−60 dBm	UE receive band
	2 620 MHz ≤ f ≤ 2 690 MHz	3.84 MHz	−60 dBm	
II	869 MHz ≤ f ≤ 894 MHz	3.84 MHz	−60 dBm	
	1 850 MHz ≤ f ≤ 1 910 MHz	3.84 MHz	−60 dBm	UE transmit band in URA_PCH, Cell_PCH and idle state
	1 930 MHz ≤ f ≤ 1 990 MHz	3.84 MHz	−60 dBm	UE receive band
	2 110 MHz ≤ f ≤ 2 170 MHz	3.84 MHz	−60 dBm	
III	921 MHz ≤ f < 925 MHz	100 kHz	−60 dBm*	
	925 MHz ≤ f ≤ 935 MHz	100 kHz 3.84 MHz	−67 dBm* −60 dBm	
	935 MHz < f ≤ 960 MHz	100 kHz	−79 dBm*	
	1 710 MHz ≤ f ≤ 1 785 MHz	3.84 MHz	−60 dBm	UE transmit band in URA_PCH, Cell_PCH and idle state
	1 805 MHz ≤ f ≤ 1 880 MHz	3.84 MHz	−60 dBm	UE receive band
	2 110 MHz ≤ f ≤ 2 170 MHz	3.84 MHz	−60 dBm	
	2 620 MHz ≤ f ≤ 2 690 MHz	3.84 MHz	−60 dBm	
IV	869 MHz ≤ f < 894 MHz	3.84 MHz	−60 dBm	
	1 710 MHz ≤ f < 1 755 MHz	3.84 MHz	−60 dBm	UE transmit band in URA_PCH, Cell_PCH and idle state
	1 930 MHz ≤ f ≤ 1 990 MHz	3.84 MHz	−60 dBm	
	2 110 MHz≤ f ≤ 2 170 MHz	3.84 MHz	−60 dBm	UE receive band

TABLE 6 (*end*)

Band	Frequency band	Measurement bandwidth	Maximum level	Note
V	824 MHz ≤ f ≤ 849 MHz	3.84 MHz	−60 dBm	UE transmit band in URA_PCH, Cell_PCH and idle state
	869 MHz ≤ f < 894 MHz	3.84 MHz	−60 dBm	UE receive band
	1 930 MHz ≤ f ≤ 1 990 MHz	3.84 MHz	−60 dBm	
	2 110 MHz ≤ f ≤ 2 170 MHz	3.84 MHz	−60 dBm	
VI	815 MHz ≤ f ≤ 850 MHz	3.84 MHz	−60 dBm	UE in URA_PCH, Cell_PCH and idle state
	860 MHz ≤ f ≤ 895 MHz	3.84 MHz	−60 dBm	UE in URA_PCH, Cell_PCH and idle state
	1 844.9 MHz ≤ f ≤ 1 879.9 MHz	3.84 MHz	−60 dBm	
	2 110 MHz ≤ f ≤ 2 170 MHz	3.84 MHz	−60 dBm	
VII	921 MHz ≤ f < 925 MHz	100 kHz	−60 dBm *	
	925 MHz ≤ f ≤ 935 MHz	100 kHz −3.84 MHz	−67 dBm* −60 dBm	
	935 MHz < f ≤ 960 MHz	100 kHz	−79 dBm*	
	1 805 MHz ≤ f ≤ 1 880 MHz	100 kHz	−71 dBm*	
	2 110 MHz ≤ f ≤ 2 170 MHz	3.84 MHz	−60 dBm	
	2 500 MHz ≤ f ≤ 2 570 MHz	3.84 MHz	−60 dBm	UE transmit band in URA_PCH, Cell_PCH and idle state
	2 620 MHz ≤ f ≤ 2 690 MHz	3.84 MHz	−60 dBm	UE receive band
VIII	880 MHz ≤ f ≤ 915 MHz	3.84 MHz	−60 dBm	UE in URA_PCH, Cell_PCH and idle state
	921 MHz ≤ f < 925 MHz	100 kHz	−60 dBm*	
	925 MHz ≤ f ≤ 935 MHz	100 kHz 3.84 MHz	−67 dBm* −60 dBm	
	935 MHz < f ≤ 960 MHz	100 kHz	−79 dBm*	
	1 805 MHz < f ≤ 1 880 MHz	3.84 MHz	−60 dBm	
	2 110 MHz ≤ f ≤ 2 170 MHz	3.84 MHz	−60 dBm	
	2 620 MHz ≤ f ≤ 2 690 MHz	3.84 MHz	−60 dBm	
IX	860 MHz ≤ f ≤ 895 MHz	3.84 MHz	−60 dBm	
	1 749.9 MHz ≤ f ≤ 1 784.9 MHz	3.84 MHz	−60 dBm	UE transmit band in URA_PCH, Cell_PCH and idle state
	1 844.9 MHz ≤ f ≤ 1 879.9 MHz	3.84 MHz	−60 dBm	UE receive band
	2 110 MHz ≤ f ≤ 2 170 MHz	3.84 MHz	−60 dBm	
X	869 MHz ≤ f < 894 MHz	3.84 MHz	−60 dBm	
	1 710 MHz ≤ f < 1 770 MHz	3.84 MHz	−60 dBm	UE transmit band in URA_PCH, Cell_PCH and idle state
	1 930 MHz ≤ f ≤ 1 990 MHz	3.84 MHz	−60 dBm	
	2 110 MHz ≤ f ≤ 2 170 MHz	3.84 MHz	−60 dBm	UE receive band

* The measurements are made on frequencies which are integer multiples of 200 kHz. As exceptions, up to five measurements with a level up to the applicable requirements defined in Table 5 are permitted for each channel used in the measurement.

Annex 2

CDMA Multi-Carrier (CDMA-2000) mobile stations

1 Spectrum mask

When transmitting with spreading rate 1, the emissions should be less than the limits specified in Table 7.

TABLE 7

Transmitter spectrum emission limits for spreading rate 1

For $\|\Delta f\|$ within the range (MHz)	Emission limit
1.25-1.98	Less stringent of –42 dBc/30 kHz or –54 dBm/1.23 MHz
1.98-2.25	Less stringent of –50 dBc/30 kHz or –54 dBm/1.23 MHz
2.25-4	$-(13 + 1 \times (\Delta f - 2.25\ \text{MHz}))$ dBm/1 MHz

NOTE 1 – All frequencies in the measurement bandwidth should satisfy the restrictions on $|\Delta f|$ where Δf = centre frequency – closer edge frequency, f, of the measurement filter.

When transmitting with spreading rate 3, the emissions should be less than the limits specified in Table 8.

TABLE 8

Transmitter spectrum emission limits for spreading rate 3

For $\|\Delta f\|$ within the range (MHz)	Emission limit
2.5-2.7	–14 dBm/30 kHz
2.7-3.5	$-(14 + 15 \times (\Delta f - 2.7\ \text{MHz}))$ dBm/30 kHz
3.08	–33 dBc/3.84 MHz
3.5-7.5	$-(13 + 1 \times (\Delta f - 3.5\ \text{MHz}))$ dBm/1 MHz
7.5-8.5	$-(17 + 10 \times (\Delta f - 7.5\ \text{MHz}))$ dBm/1 MHz
8.08	–43 dBc/3.84 MHz
8.5-12.5	–27 dBm/1 MHz

NOTE 1 – All frequencies in the measurement bandwidth should satisfy the restrictions on $|\Delta f|$ where Δf = centre frequency – closer edge frequency, f, of the measurement filter.

The requirements at offsets of 3.08 and 8.08 MHz are equivalent to ACLR requirements of 33 and 43 dB from a spreading rate 3 mobile station transmitter into a spreading rate 3 or IMT-2000 CDMA direct spread MS receiver offset by 5 and 10 MHz respectively.

2 Transmitter spurious emissions (conducted)

When transmitting with spreading rate 1 or spreading rate 3, the spurious emissions should be less than the limits specified in Tables 9 and 10.

TABLE 9

Transmitter spurious emission limits for spreading rates 1 and 3 respectively

For $\|\Delta f\|$ within the range	Frequency bandwidth	Measurement bandwidth	Emission limit (dBm)
> 4 MHz for spreading rate 1	9 kHz < f < 150 kHz	1 kHz	–36
	150 kHz < f < 30 MHz	10 kHz	–36
> 12.5 MHz for spreading rate 3	30 MHz < f < 1 GHz	100 kHz	–36
	1 GHz < f < 12.75 GHz	1 MHz	–30

NOTE 1 – All frequencies in the measurement bandwidth should satisfy the restrictions on $|\Delta f|$ where Δf = centre frequency – closer edge frequency, f, of the measurement filter.

TABLE 10

Additional transmitter spurious emission limits for spreading rates 1 and 3 respectively

Measurement frequency (MHz)	Measurement bandwidth (kHz)	Emission limit (dBm)	Victim band
1 893.5-1 919.6	300	–41	PHS
925-935	100	–67	GSM 900
935-960	100	–79	GSM 900
1 805-1 880	100	–71	DCS 1800

NOTE 1 – Measurements apply only when the measurement frequency is at least 11.25 MHz (spreading rate 1) or 12.5 MHz (spreading rate 3) from the CDMA centre frequency. The non-PHS system band measurements are made on frequencies which are integer multiples of 200 kHz. As exceptions, up to five measurements with a level up to the spurious emission limits in Table 9 are allowed.

3 Receiver spurious emissions (conducted)

The conducted spurious emissions when not transmitting for a MS should be less than the limits in Table 11.

TABLE 11

General receiver spurious emission requirements

Frequency band	Measurement bandwidth	Maximum level (dBm)	Note
30 MHz ≤ f < 1 GHz	100 kHz	–57	
1 GHz ≤ f ≤ 12.75 GHz	1 MHz	–47	With the exception of the frequencies covered by Table 12, for which additional receiver spurious emission requirements apply

TABLE 12

Additional receiver spurious emission requirements

Frequency band	Measurement bandwidth (MHz)	Maximum level (dBm)	Note
1 920 ≤ f ≤ 1 980 MHz	1	–61	Mobile transmit band
2 110 ≤ f ≤ 2 170 MHz	1	–76	Mobile receive band

Annex 3

CDMA TDD (UTRA TDD) mobile stations

1 Measurement uncertainty

Values specified in this Annex differ from those specified in Recommendation ITU-R M.1457 since values in this Annex incorporate test tolerances defined in Recommendation ITU-R M.1545.

2 Spectrum mask

2.1 Spectrum mask (3.84 Mchip/s TDD option)

The spectrum emission mask of the MS applies to frequency offsets (Δf) between 2.5 and 12.5 MHz on both sides of the carrier frequency.

The out-of-channel emission is specified as a power level relative to the MS output power in a frequency band of 3.84 MHz bandwidth.

The power of any MS emission should not exceed −48.5 dBm/3.84 MHz or the levels specified in Table 13a, whichever is higher.

TABLE 13a

Spectrum emission mask requirement (3.84 Mchip/s TDD option)

Δf[1] (MHz)	Minimum requirement	Measurement bandwidth
2.5-3.5	$-33.5 - 15^{(1)}(\Delta f/\text{MHz} - 2.5)$ dBc	30 kHz[2]
3.5-7.5	$-33.5 - 1^{(1)}(\Delta f/\text{MHz} - 3.5)$ dBc	1 MHz[3]
7.5-8.5	$-37.5 - 10^{(1)}(\Delta f/\text{MHz} - 7.5)$ dBc	1 MHz[3]
8.5-12.5	−47.5 dBc	1 MHz[3]

(1) Δf is the separation between the carrier frequency and the centre of the measuring filter.

(2) The first and last measurement positions with a 30 kHz filter at Δf equals 2.515 MHz and 3.485 MHz.

(3) The first and last measurement positions with a 1 MHz filter at Δf equals 4 MHz and 12 MHz. As a general rule, the resolution bandwidth of the measuring equipment should be equal to the measurement bandwidth. To improve measurement accuracy, sensitivity and efficiency, the resolution bandwidth can be different from the measurement bandwidth. When the resolution bandwidth is smaller than the measurement bandwidth, the result should be integrated over the measurement bandwidth in order to obtain the equivalent noise bandwidth of the measurement bandwidth.

NOTE 1 – The lower limit should be −50 dBm/3.84 MHz or the minimum requirement presented in this table, whichever is the higher.

2.2 Spectrum mask (1.28 Mchip/s TDD option)

The spectrum emission mask of the MS applies to frequency offsets between 0.8 and 4.0 MHz on both sides of the carrier frequency.

The out-of-channel emission is specified as a power level relative to the MS output power in a frequency band of 1.6 MHz bandwidth.

TABLE 13b

Spectrum emission mask requirement (1.28 Mchip/s TDD option)

Δf[1] (MHz)	Minimum requirement	Measurement bandwidth
0.8	−33.5 dBc[3]	30 kHz[2]
0.8-1.8	$-33.5 - 14^{(1)}(\Delta f/\text{MHz} - 0.8)$ dBc[3]	30 kHz[2]
1.8-2.4	$-47.5 - 25^{(1)}(\Delta f/\text{MHz} - 1.8)$ dBc[3]	30 kHz[2]
2.4-4.0	−42.5 dBc[3]	1 MHz[3]

(1) Δf is the separation between the carrier frequency and the centre of the measuring filter.

(2) The first and last measurement positions with a 30 kHz filter at Δf equals to 0.815 MHz and 2.385 MHz.

(3) The first and last measurement positions with a 1 MHz filter at Δf equals 2.9 MHz and 3.5 MHz. As a general rule, the resolution bandwidth of the measuring equipment should be equal to the measurement bandwidth. To improve measurement accuracy, sensitivity and efficiency, the resolution bandwidth can be different from the measurement bandwidth. When the resolution bandwidth is smaller than the measurement bandwidth, the result should be integrated over the measurement bandwidth in order to obtain the equivalent noise bandwidth of the measurement bandwidth.

NOTE 1 – The lower limit should be −55 dBm/1.28 MHz or the minimum requirement presented in this table, whichever is the higher.

2.3 Spectrum mask (7.68 Mchip/s TDD option)

The spectrum emission mask of the UE applies to frequencies which are between 5 MHz and 25 MHz from the UE centre carrier frequency. The out-of-channel emission is specified relative to the RRC filtered mean power of the UE carrier.

The power of any UE emission should not exceed the levels specified in Table 13c.

TABLE 13c

Spectrum emission mask requirement (7.68 Mchip/s TDD option)

Δf[(1)] (MHz)	Minimum requirement	Measurement bandwidth
5.0-5.75	$\left\{-36.5-10.67\cdot\left(\frac{\Delta f}{\text{MHz}}-5.0\right)\right\}$ dBc	30 kHz[(2)]
5.75-7.0	$\left\{-44.5-5.6\cdot\left(\frac{\Delta f}{\text{MHz}}-5.75\right)\right\}$ dBc	30 kHz[(2)]
7.0-15	$\left\{-36.5-0.5\cdot\left(\frac{\Delta f}{\text{MHz}}-7.0\right)\right\}$ dBc	1 MHz[(3)]
15.0-17.0	$\left\{-40.5-5.0\cdot\left(\frac{\Delta f}{\text{MHz}}-15.0\right)\right\}$ dBc	1 MHz[(3)]
17.0-25.0	−51.5 dBc	1 MHz[(3)]

(1) Δf is the separation between the carrier frequency and the centre of the measuring filter.

(2) The first and last measurement positions with a 30 kHz filter at Δf equals 5.015 MHz and 6.985 MHz.

(3) The first and last measurement positions with a 1 MHz filter at Δf equals 7.5 MHz and 24.5 MHz. As a general rule, the resolution bandwidth of the measuring equipment should be equal to the measurement bandwidth. To improve measurement accuracy, sensitivity and efficiency, the resolution bandwidth can be different from the measurement bandwidth. When the resolution bandwidth is smaller than the measurement bandwidth, the result should be integrated over the measurement bandwidth in order to obtain the equivalent noise bandwidth of the measurement bandwidth.

NOTE 1 – The lower limit should be −47 dBm/7.68 MHz or the minimum requirement presented in this table, whichever is the higher.

3 ACLR

ACLR is the ratio of the transmitted power to the power measured after a receiver filter in the adjacent channel(s). Both the transmitted power and the received power are measured through a matched filter (root raised cosine and roll-off 0.22) with a noise power bandwidth equal to the chip rate. The requirements should apply whatever the type of transmitter considered (single carrier or multi-carrier). It applies for all transmission modes foreseen by the manufacturer's specification. The limit for ACLR should be as specified in Table 14a).

TABLE 14

a) MS ACLR limits for 3.84 Mchip/s TDD option

Adjacent channel	ACLR limit (dB)
MS channel ± 5 MHz	32.2
MS channel ± 10 MHz	42.2

b) MS ACLR limits for 1.28 Mchip/s TDD option

Adjacent channel	ACLR limit (dB)
MS channel ± 1.6 MHz	32.2
MS channel ± 3.2 MHz	42.2

c) MS ACLR limits for 7.68 Mchip/s TDD option

Adjacent channel	Chip rate for RRC measurement filter (MHz)	ACLR limit (dB)
MS channel ± 7.5 MHz	3.84	32.2
MS channel ± 12.5 MHz	3.84	42.2
MS channel ± 10.0 MHz	7.68	32.2
MS channel ± 20.0 MHz	7.68	42.2

4 Transmitter spurious emissions (conducted)

The spurious emissions should be less than the limits specified in Tables 15, 16a), 16b) and 16c). The following requirements are only applicable for MS centre carrier frequency offsets greater than 12.5 MHz (3.84 Mchip/s TDD option), 4 MHz (1.28 Mchip/s TDD option) or 25 MHz (7.68 Mchip/s TDD option).

TABLE 15

General spurious emissions requirements

Frequency band	Measurement bandwidth	Minimum requirement (dBm)
9 kHz ≤ f < 150 kHz	1 kHz	–36
150 kHz ≤ f < 30 MHz	10 kHz	–36
30 MHz ≤ f < 1 000 MHz	100 kHz	–36
1 GHz ≤ f < 12.75 GHz	1 MHz	–30

TABLE 16

a) Additional spurious emissions requirements (3.84 Mchip/s TDD option)

Frequency bandwidth	Measurement bandwidth	Minimum requirement (dBm)
921 MHz ≤ f < 925 MHz	100 kHz	−60 (Note 1)
925 MHz ≤ f ≤ 935 MHz	100 kHz	−67 (Note 1)
935 MHz < f ≤ 960 MHz	100 kHz	−79 (Note 1)
1 805 MHz ≤ f ≤ 1 880 MHz	100 kHz	−71 (Note 1)
2 620 MHz ≤ f ≤ 2 690 MHz	3.84 MHz	−37 (Note 1)
1 884.5 MHz ≤ f ≤ 1 919.6 MHz	300 kHz	−41 (Note 2)

NOTE 1 – The measurements are made on frequencies which are integer multiples of 200 kHz. As exceptions, up to five measurements with a level up to the applicable requirements defined in Table 15 are permitted for each absolute RF channel used in the measurement.

NOTE 2 – Applicable for transmission in 2 010-2 025 MHz.

b) Additional spurious emissions requirements (1.28 Mchips TDD option)

Frequency bandwidth	Measurement bandwidth	Minimum requirement (dBm)
921 MHz ≤ f < 925 MHz	100 kHz	−60 (Note 1)
925 MHz ≤ f ≤ 935 MHz	100 kHz	−67 (Note 1)
935 MHz < f ≤ 960 MHz	100 kHz	−79 (Note 1)
1 805 MHz ≤ f ≤ 1 880 MHz	100 kHz	−71 (Note 1)
2 620 MHz ≤ f ≤ 2 690 MHz	3.84 MHz	−37 (Note 1)

NOTE 1 – The measurements are made on frequencies which are integer multiples of 200 kHz. As exceptions, up to five measurements with a level up to the applicable requirements defined in Table 15 are permitted for each absolute RF channel used in the measurement.

c) Additional spurious emissions requirements (7.68 Mchips TDD option)

Frequency bandwidth	Measurement bandwidth	Minimum requirement (dBm)
921 MHz ≤ f < 925 MHz	100 kHz	−60 (Note 1)
925 MHz ≤ f ≤ 935 MHz	100 kHz	−67 (Note 1)
935 MHz < f ≤ 960 MHz	100 kHz	−79 (Note 1)
1 805 MHz ≤ f ≤ 1 880 MHz	100 kHz	−71 (Note 1)
2 620 MHz ≤ f ≤ 2 690 MHz	3.84 MHz	−37 (Note 1)
1 884.5 MHz ≤ f ≤ 1 919.6 MHz	300 kHz	−41 (Note 2)

NOTE 1 – The measurements are made on frequencies which are integer multiples of 200 kHz. As exceptions, up to five measurements with a level up to the applicable requirements defined in Table 15 are permitted for each absolute RF channel used in the measurement.

NOTE 2 – Applicable for transmission in 2 010-2 025 MHz.

5 Receiver spurious emissions (conducted)

The power of any spurious emissions from the receiver should not exceed the limits given in Tables 17, 18a), 18b) and 18c).

TABLE 17

General receiver spurious emission requirements

Frequency band	Measurement bandwidth	Maximum level (dBm)	Note
30 MHz ≤ f < 1 GHz	100 kHz	–57	
1 GHz ≤ f ≤ 12.75 GHz	1 MHz	–47	With the exception of the frequencies covered by Tables 18a), 18b) and 18c), for which additional receiver spurious emission requirements apply.

TABLE 18

a) Receiver spurious emission requirements (3.84 Mchip/s TDD option)

Band	Maximum level	Measurement bandwidth	Note
30 MHz-1 GHz	−57 dBm	100 kHz	
1 GHz-1.9 GHz and 1.92 GHz-2.01 GHz and 2.025 GHz-2.11 GHz and 2.17 GHz-2.57 GHz	−47 dBm	1 MHz	With the exception of frequencies between 12.5 MHz below the first carrier frequency and 12.5 MHz above the last carrier frequency used by the MS.
1.9 GHz-1.92 GHz and 2.01 GHz-2.025 GHz and 2.11 GHz-2.170 GHz and 2.57 GHz-2.69 GHz	−60 dBm	3.84 MHz	With the exception of frequencies between 12.5 MHz below the first carrier frequency and 12.5 MHz above the last carrier frequency used by the MS.
2.69 GHz-12.75 GHz	−47 dBm	1 MHz	

b) Receiver spurious emission requirements (1.28 Mchip/s TDD option)

Band	Maximum level	Measurement bandwidth	Note
30 MHz-1 GHz	−57 dBm	100 kHz	
1 GHz-1.9 GHz and 1.92 GHz-2.01 GHz and 2.025 GHz-2.11 GHz and 2.17 GHz-2.57 GHz	−47 dBm	1 MHz	With the exception of frequencies between 4 MHz below the first carrier frequency and 4 MHz above the last carrier frequency used by the MS.
1.9 GHz-1.92 GHz and 2.01 GHz-2.025 GHz and 2.11 GHz-2.170 GHz and 2.57 GHz-2.69 GHz	−64 dBm	1.28 MHz	With the exception of frequencies between 4 MHz below the first carrier frequency and 4 MHz above the last carrier frequency used by the MS.
2.69 GHz 12.75 GHz	−47 dBm	1 MHz	

TABLE 18 (*end*)

c) Receiver spurious emission requirements (7.68 Mchip/s TDD option)

Band	Maximum level	Measurement bandwidth	Note
30 MHz-1 GHz	−57 dBm	100 kHz	
1 GHz-1.9 GHz and 1.92 GHz-2.01 GHz and 2.025 GHz-2.11 GHz and 2.17 GHz-2.57 GHz	−47 dBm	1 MHz	With the exception of frequencies between 25 MHz below the first carrier frequency and 25 MHz above the last carrier frequency used by the MS.
1.9 GHz-1.92 GHz and 2.01 GHz-2.025 GHz and 2.11 GHz-2.170 GHz and 2.57 GHz-2.69 GHz	−57 dBm	7.68 MHz	With the exception of frequencies between 25 MHz below the first carrier frequency and 25 MHz above the last carrier frequency used by the MS.
2.69 GHz-12.75 GHz	−47 dBm	1 MHz	

Annex 4

TDMA Single-Carrier (UWC-136) mobile stations

Part A

Conformance requirements (30 kHz)

1 Spectrum mask

Spectrum noise suppression is the restraint of sideband energy outside the active transmit channel. This RF spectrum is the result of power ramping, modulation and all sources of noise. The spectrum is primarily the result of events that do not occur at the same time: digital modulation and power ramping (switching transients). The RF spectrum from these two events are specified separately.

Adjacent and first or second alternate channel power is that part of the mean power output of the transmitter resulting from the modulation and noise which falls within a specified passband centred on either of the adjacent or first or second alternate channels.

The emission power should not exceed the limits specified in Table 19.

TABLE 19

Adjacent and alternate channel power requirements

Channel	Maximum level
In either adjacent channel, centred ±30 kHz from the centre frequency	26 dB below the mean output power
In either alternate channel, centred ±60 kHz from the centre frequency	45 dB below the mean output power
In either second alternate channel centred ±90 kHz from the centre frequency	45 dB below the mean output power or –13 dBm measured in 30 kHz bandwidth, whichever is the lower power

OoB power arising from switching transients is the peak power of the spectrum, arising from the ramping-on and ramping-off of the transmitter, that fall within defined frequency bands outside the active transmit channel.

The peak emission power should not exceed the limits specified in Table 20.

TABLE 20

Switching transients requirements

Channel	Maximum level
In either adjacent channel, centred ±30 kHz from the centre frequency	26 dB below the peak output power reference
In either alternate channel, centred ±60 kHz from the centre frequency	45 dB below the peak output power reference
In either second alternate channel centred ±90 kHz from the centre frequency	45 dB below the peak output power reference or –13 dBm measured in 30 kHz bandwidth, whichever is the lower power

2 Transmitter spurious emissions (conducted)

The power of any spurious emission should not exceed the limits specified in Table 21.

TABLE 21

MS spurious emission limits

Band (f) [1]	Maximum level (dBm)	Measurement bandwidth	Note
9 kHz ≤ f ≤ 150 kHz	–36	1 kHz	[2]
150 kHz < f ≤ 30 MHz	–36	10 kHz	[2]
30 MHz < f ≤ 1 000 MHz	–36	100 kHz	[2]
1 000 MHz < f < 1 920 MHz	–30	1 MHz	[2]
1 920 MHz ≤ f ≤ 1 980 MHz	–30	30 kHz	[3]
1 980 MHz < f < 2 110 MHz	–30	1 MHz	[2]
2 110 MHz ≤ f ≤ 2 170 MHz	–70	30 kHz	[4]
2 170 MHz < f ≤ 12.75 GHz	–30	1 MHz	[2]

[1] f is the frequency of the spurious emission.

[2] In accordance with the applicable clauses of Recommendation ITU-R SM.329.

[3] MS transmit band.

[4] MS receive band.

2.1 Coexistence with services in adjacent frequency bands

This requirement provides for the protection of receivers operating in bands adjacent to the MS transmit frequency band of 1 920 to 1 980 MHz: GSM 900, R-GSM and UTRA TDD.

NOTE 1 – UTRA FDD operates in the same frequency band as UWC-136.

The power of any spurious emission should not exceed the limits specified in Table 22.

TABLE 22

Additional spurious emissions requirements

Service	Frequency band	Measurement bandwidth (kHz)	Limit (dBm)
R-GSM	921 ≤ f ≤ 925 MHz	100	–60
R-GSM	925 < f ≤ 935 MHz	100	–67
GSM 900/R-GSM	935 < f ≤ 960 MHz	100	–79
DCS 1800	1 805 ≤ f ≤ 1 880 MHz	100	–71
UTRA TDD	1 900 ≤ f ≤ 1 920 MHz	100	–62
UTRA TDD	2 010 ≤ f ≤ 2 025 MHz	100	–62

NOTE 1 – The measurements are made on frequencies which are integer multiples of 200 kHz. Up to five exceptions of up to –36 dBm are permitted in the GSM 900, DCS 1800 and UTRA bands, and up to three exceptions of up to –36 dBm are permitted in the GSM 400 bands.

3 Receiver spurious emissions (idle mode)

The power of any spurious emissions should not exceed the limits given in Table 23.

TABLE 23

General receiver spurious emission requirements

Frequency band	Measurement bandwidth	Maximum level (dBm)	Note
30 MHz ≤ f < 1 GHz	100 kHz	–57	
1 GHz ≤ f ≤ 12.75 GHz	1 MHz	–47	With the exception of the frequencies covered by the table below, for which additional receiver spurious emission requirements apply[1]

[1] (*Editorial Note*) – In TFES Harmonized Standard v1.0.2, no additional receiver spurious emission is specified; yet, it is expected that there will be a table added, in the same form as for the other technologies (see Tables 5, 12 and 18).

Part B

Conformance requirements (200 kHz)

The 200 kHz channel provides packet data service and employs both 8-level phase shift keying (8-PSK) and Gaussian minimum shift keying (GMSK) modulations.

1 Spectrum mask

Output RF spectrum is the relationship between the frequency offset from the carrier and the power, measured in a specified bandwidth and time, produced by the MS due to the effects of modulation and power ramping.

The specifications contained in this subclause apply in frequency hopping as well as in non-frequency hopping modes.

Due to the bursty nature of the signal, the output RF spectrum results from two effects: the modulation process, and the power ramping up and down (switching transients).

– The level of the output RF spectrum due to GMSK and 8-PSK modulations should be no more than that given in Tables 24 and 25.

– The level of the output RF spectrum due to switching transients should be no more than that given in Table 26.

– The power emitted should not exceed –71 dBm in frequency band 2 110-2 170 MHz.

2 Spectrum due to the modulation and wideband noise

The output RF modulation spectrum is specified in Tables 24 and 25. This specification applies for all RF channels supported by the equipment.

The specification applies to the entire relevant transmit band and up to 2 MHz either side.

The limits should be met under the following measurement conditions:

– Zero frequency scan, filter bandwidth and video bandwidth of 30 kHz up to 1 800 kHz from the carrier and 100 kHz at 1 800 kHz and above from the carrier, with averaging done over 50% to 90% of the useful part of the transmitted bursts, excluding the midamble, and then averaged over at least 200 such burst measurements. Above 1 800 kHz from the carrier, only measurements centred on 200 kHz multiples are taken with averaging over 50 bursts.

– When tests are done in frequency hopping mode, the averaging should include only bursts transmitted when the hopping carrier corresponds to the nominal carrier of the measurement. The limits then apply to the measurement results for any of the hopping frequencies.

The figures in Table 24, at the vertically listed power level (dBm) and at the horizontally listed frequency offset from the carrier (kHz), are then the maximum allowed level (dB) relative to a measurement in 30 kHz on the carrier.

NOTE 1 – This approach of specification has been chosen for convenience and speed of testing. It does however require careful interpretation if there is a need to convert figures in the following tables into spectral density values, in that only part of the power of the carrier is used as the relative reference, and in addition different measurement bandwidths are applied at different offsets from the carrier.

TABLE 24

Relative maximum level due to modulation

Carrier power (dBm)	**Frequency offset (kHz)**							
	100	200	250	400	≥ 600 < 1 200	≥ 1 200 < 1 800	≥ 1 800 < 6 000	≥ 6 000
≥ 33	+0.5	–30	–33	–60	–60	–60	–68	–76
32	+0.5	–30	–33	–60	–60	–60	–67	–75
30	+0.5	–30	–33	–60	–60[(1)]	–60	–65	–73
28	+0.5	–30	–33	–60	–60[(1)]	–60	–63	–71
26	+0.5	–30	–33	–60	–60[(1)]	–60	–61	–69
≤ 24	+0.5	–30	–33	–60	–60[(1)]	–60	–59	–67

(1) For equipment supporting 8-PSK, the requirement for 8-PSK modulation is –54 dB.

The following exceptions should apply, using the same measurement conditions as specified above:

– In the combined range of 600 kHz to 6 MHz above and below the carrier, in up to three bands of 200 kHz width centred on a frequency which is an integer multiple of 200 kHz, exception levels of up to –36 dBm are allowed.

– Above 6 MHz offset from the carrier in up to 12 bands of 200 kHz width centred on a frequency which is an integer multiple of 200 kHz, exception levels of up to –36 dBm are allowed.

Using the same measurement conditions as specified above, if a requirement in Table 24 results in lower than the power limit given in Table 25, then the latter should be applied instead.

TABLE 25

Absolute maximum level due to modulation

Frequency offset from the carrier (kHz)	Level (dBm)
< 600	–36
≥ 600, < 1 800	–56
≥ 1 800	–51

3 Spectrum due to switching transients

These effects are also measured in the time domain and the specifications assume the following measurement conditions: zero frequency scan, filter bandwidth 30 kHz, peak hold, and video bandwidth 100 kHz. Table 26 specifies the limits.

TABLE 26

Maximum levels due to switching transients

Carrier power level (dBm)	Maximum level measured at various frequency offsets			
	400 kHz	600 kHz	1 200 kHz	1 800 kHz
39	–21 dBm	–26 dBm	–32 dBm	–36 dBm
≤ 37	–23 dBm	–26 dBm	–32 dBm	–36 dBm

NOTE 1 – The relaxation for carrier power level 39 dBm is in line with the modulated spectra and thus causes negligible additional interference to an analogue system by an UWC-136 200 kHz signal.

NOTE 2 – The near-far dynamics with this specification has been estimated to be approximately 58 dB for MS operating at a power level of 8 W or 49 dB for MSs operating at a power level of 1 W. The near-far dynamics then gradually decreases by 2 dB per power level down to 32 dB for MSs operating in cells with a maximum allowed output power of 20 mW or 29 dB for MS operating at 10 mW.

NOTE 3 – The possible performance degradation due to switching transient leaking into the beginning or the end of a burst, was estimated and found to be acceptable with respect to the BER due to co-channel interference (C/I).

4 Transmitter spurious emissions (conducted)

The power of any spurious emission should not exceed the limits specified in Table 27.

TABLE 27

MS spurious emission limits

Band (f)[1]	Measurement bandwidth	Maximum level (dBm)	Note
9 kHz ≤ f ≤ 150 kHz	1 kHz	–36	[2]
150 kHz < f ≤ 30 MHz	10 kHz	–36	[2]
30 MHz < f ≤ 1 000 MHz	100 kHz	–36	[2]
1 000 MHz < f < 1 920 MHz	1 MHz	–30	[2]
1 920 MHz ≤ f ≤ 1 980 MHz	100 kHz	–36	[3]
1 980 MHz < f < 2 110 MHz	1 MHz	–30	[2]
2 110 MHz ≤ f ≤ 2 170 MHz	100 kHz	–66	[4]
2 170 MHz < f ≤ 12.75 GHz	1 MHz	–30	[2]

[1] f is the frequency of the spurious emission.

[2] In accordance with the applicable clauses of Recommendation ITU-R SM.329.

[3] MS transmit band.

[4] MS receive band.

5 Coexistence with services in adjacent frequency bands

This requirement provides for the protection of receivers operating in bands adjacent to the MS transmit frequency band of 1 920 MHz to 1 980 MHz: GSM 900, R-GSM, UTRA TDD.

The power of any spurious emission should not exceed the limits specified in Table 28.

TABLE 28

Additional spurious emissions requirements

Service	Frequency band	Measurement bandwidth (kHz)	Minimum requirement (dBm)
R-GSM	921 ≤ f ≤ 925 MHz	100	–60
R-GSM	925 < f ≤ 935 MHz	100	–67
GSM 900/R-GSM	935 < f ≤ 960 MHz	100	–79
DCS 1800	1 805 ≤ f ≤ 1 880 MHz	100	–71
UTRA TDD	1 900 ≤ f ≤ 1 920 MHz	100	–62
UTRA TDD	2 010 ≤ f ≤ 2 025 MHz	100	–62

NOTE 1 – The measurements are made on frequencies which are integer multiples of 200 kHz. Up to five exceptions of up to –36 dBm are permitted in the GSM 900, DCS 1800 and UTRA bands, and up to three exceptions of up to –36 dBm are permitted in the GSM 400 bands.

6 Receiver spurious emissions (idle mode)

The power of any spurious emissions should not exceed the limits given in Table 29.

TABLE 29

General receiver spurious emission requirements

Frequency band	Measurement bandwidth	Maximum level (dBm)	Note
30 MHz ≤ f < 1 GHz	100 kHz	–57	
1 GHz ≤ f ≤ 12.75 GHz	1 MHz	–47	With the exception of the frequencies covered by the table below, for which additional receiver spurious emission requirements apply(1)

(1) (*Editorial Note*) – In TFES Harmonized Standard v1.0.2, no additional receiver spurious emission is specified; yet, it is expected that there will be a table added, in the same form as for the other technologies (see Tables 5, 12 and 18).

Annex 5

FDMA/TDMA (digital enhanced cordless telecommunications (DECT)) mobile stations

1 Spectrum mask

If the equipment under test (EUT) is equipped with antenna diversity, the EUT should have the diversity operation defeated for the following tests.

2 Emissions due to modulation

The unwanted emission(s) due to modulation is the power measured in any DECT RF channel other than the one in which the EUT is transmitting, integrated over a bandwidth of 1 MHz.

With transmissions on physical channel Ra (K, L, M, N) in successive frames, the power in physical channel Ra (K, L, Y, N) should be less than the values given in Table 30.

TABLE 30

Emissions modulation

Emissions on RF channel "*Y*"	Measurement bandwidth	Maximum power level
$Y = M \pm 1$	(1)	160 µW (–8 dBm)
$Y = M \pm 2$	(1)	1 µW (–30 dBm)
$Y = M \pm 3$	(1)	80 nW (–41 dBm)
Y = any other DECT channel	(1)	40 nW (–44 dBm)(2)

(1) The power in RF channel Y is defined by integration over a bandwidth of 1 MHz centred on the nominal centre frequency, F_Y, averaged over at least 60% but less than 80% of the physical packet, and starting before 25% of the physical packet has been transmitted but after the synchronization word.

(2) For Y = "any other DECT channel", the maximum power level should be less than 40 nW (–44 dBm) except for one instance of a 500 nW (–33 dBm) signal.

3 Emissions due to transmitter transients

The power level of all modulation products (including AM components due to the switching on or off of the modulated RF carrier) in a DECT RF channel as a result of a transmission on another DECT RF channel.

The power level of all modulation products (including AM products due to the switching on or off of a modulated RF carrier) arising from a transmission on RF channel M should, when measured using a peak hold technique, be less than the values given in Table 31.

TABLE 31

Emissions due to transmitter transients

Emissions on RF channel "*Y*"	Measurement bandwidth	Maximum power level
$Y = M \pm 1$	(1)	250 µW (–6 dBm)
$Y = M \pm 2$	(1)	40 µW (–14 dBm)
$Y = M \pm 3$	(1)	4 µW (–24 dBm)
Y = any other DECT channel	(1)	1 µW (–30 dBm)

(1) The measurement bandwidth should be 100 kHz and the power should be integrated over a 1 MHz bandwidth centred on the DECT frequency, F_Y.

4 Transmitter spurious emissions (conducted)

4.1 Spurious emissions when allocated a transmit channel

The spurious emissions, when a radio end point has an allocated physical channel, should meet the requirements of Table 32. The requirements of Table 32 are only applicable for frequencies which are greater than 12.5 MHz away from the centre frequency, f_c, of a carrier.

TABLE 32

Spurious emissions requirements

Frequency	Minimum requirement/ Reference bandwidth
30 MHz ≤ f < 1 000 MHz	–36 dBm/100 kHz
1 GHz ≤ f < 12.75 GHz	–30 dBm/1 MHz
f_c – 12.5 MHz < f < f_c + 12.5 MHz	Not defined

Measurements should not be made for transmissions on the RF channel closest to the nearest band edge for frequency offsets of up to 2 MHz.

5 Receiver spurious emissions (idle mode)

5.1 Spurious emissions when the EUT has no allocated transmit channel

The power level of any spurious emissions when the radio end point has no allocated transmit channel should not exceed the limits specified in Table 33.

TABLE 33

Receiver spurious emissions

Frequency band	Measurement bandwidth	Maximum level (dBm)	Note
30 MHz ≤ f < 1 GHz	100 kHz[(1)]	–57	
1 GHz ≤ f ≤ 12.75 GHz	1 MHz[(1)]	–47	With the exception of the frequencies within the DECT band, covered by Table 34

(1) The power should be measured using a peak hold technique.

5.2 In the DECT band

The power level of any receiver spurious emissions within the DECT band should not exceed the limit in Table 34.

TABLE 34

Receiver spurious emissions within DECT band

Frequency band (MHz)	Measurement bandwidth (MHz)	Maximum level (dBm)
1 900-1 920 2 010-2 025	1	–57(1)

(1) The following exceptions are allowed:

– in one 1 MHz band, the maximum allowable e.r.p. should be less than 20 nW;

– in up to two bands of 30 kHz, the maximum e.r.p. should be less than 250 nW.

Annex 6

IMT-2000 OFDMA TDD WMAN mobile stations

This Annex defines the unwanted emission limits for IMT-2000 OFDMA TDD WMAN mobile stations.

1 Spectrum emission mask

The spectrum emission mask of user equipment applies to frequencies between 2.5 MHz and 12.5 MHz away from the user equipment centre frequency for the 5 MHz carrier and between 5 MHz and 25 MHz away from the user equipment centre frequency for the 10 MHz carrier.

TABLE 35

Spectrum emission mask for 10 MHz carrier

Segment number	Offset from channel centre frequency (MHz)	Integration bandwidth (kHz)	Allowed emission level (dBm/integration bandwidth)
1	5 to < 6	100	−13.00
2	6 to < 10	1 000	−13.00
3	10 to < 11	1 000	$-13 - 12(\Delta f - 10)$
4	11 to < 15	1 000	−25.00
5	15 to < 20	1 000	If $PTx,max \leq +23$ then $-21 - 32/19 \times (\Delta f - 10.5)$ else −25
6	20 to < 25	1 000	If $PTx,max \leq +23$ then −37.00 else −25

NOTE 1 – Maximum transmitter output power of user equipment is 23 dBm or smaller in Japan.

In Table 35:

– Channel bandwidth is 10 MHz.

– Integration bandwidth refers to the frequency range over which the emission power is integrated.

– Δf is defined as the frequency offset in MHz from the channel centre frequency.

– *PTx,max* is the maximum declared output power for the user equipment.

TABLE 36

Spectrum emission mask for 5 MHz carrier

Segment number	Offset from channel centre frequency (MHz)	Integration bandwidth (kHz)	Allowed emission level (dBm/integration bandwidth)
1	2.5 to < 3.5	50	−13.00
2	3.5 to < 7.5	1 000	−13.00
3	7.5 to < 8	1 000	If $PTx,max \leq +23$ then $-20 - 2.28 \times (\Delta f - 7.5)$ else −13.00
4	8 to < 10.4	1 000	−25.00
5	10.4 to < 12.5	1 000	If $PTx,max \leq +23$ then $-21 - 1.68 \times (\Delta f - 8)$ else −25

NOTE 1 – Maximum transmitter output power of user equipment is 23 dBm or smaller in Japan.

In Table 36:

– Channel bandwidth is 5 MHz.

– Integration bandwidth refers to the frequency range over which the emission power is integrated.

2 Transmitter spurious emissions (conducted)

IMT-2000 OFDMA TDD WMAN user equipment complies with the limits recommended in Recommendation ITU-R SM.329-10. The limits shown in Tables 37 and 38 are only applicable for frequency offsets which are greater than 12.5 MHz away from the user equipment centre frequency for the 5 MHz carrier and greater than 25 MHz for the 10 MHz carrier. f is the frequency of the spurious domain emissions. f_c is the user equipment center frequency.

The emission levels in Table 37 should be met in areas where Category A levels for spurious emissions, as defined in Recommendation ITU-R SM.329-10, are applicable. The emission levels in Table 38 should be met in areas where Category B levels for spurious emissions, as defined in Recommendation ITU-R SM.329-10, are applicable.

TABLE 37

General user equipment spurious emissions limit

Band	Measurement bandwidth		Allowed emission level
9 kHz ≤ f < 150 kHz	1 kHz		−13
150 kHz ≤ f < 30 MHz	10 kHz		−13
30 MHz ≤ f < 1 000 MHz	100 kHz		–36 dBm
1 GHz ≤ f < 13.45 GHz	30 kHz	If 2.5 × BW ≤ $\lvert f_c - f \rvert$ < 10 × BW	–30 dBm
	300 kHz	If 10 × BW ≤ $\lvert f_c - f \rvert$ < 12 × BW	
	1 MHz	If 12 × BW ≤ $\lvert f_c - f \rvert$	

TABLE 38

Additional user equipment spurious emission limit

Frequency bandwidth	Measure-ment bandwidth	Minimum requirement (dBm)		Note
1 000 MHz ≤ f < 2 505 MHz	1 MHz	−13		
2 505 MHz ≤ f < 2 530 MHz	1 MHz	−37		
2 530 MHz ≤ f < 2 535 MHz	1 MHz	1.7f − 4 338		
2 535 MHz ≤ f < 2 630 MHz	1 MHz	−21 − 1.68*(Δf − 8)	12.5 MHz < Δf < 17.5 MHz	For 5 MHz channel size
		−37	17.5 MHz < Δf < 22.5 MHz	
		−18	22.5 MHz < Δf	
		−18	25 MHz < Δf	For 10 MHz channel size
2 630 MHz ≤ f < 2 630.5 MHz	1 MHz	−13 − 8/3.5 × (f − 2 627)		
2 630.5 MHz ≤ f < 2 640 MHz	1 MHz	−21 − 16/9.5× (f − 2 630.5)		
2 640 MHz ≤ f < 2 655 MHz	1 MHz	−37		
2 655 MHz ≤ f	1 MHz	−13		

NOTE 1 – The allowed emission level shall be applied for the frequency range greater than 2.5 times the channel size from the centre frequency. Δf is the offset from channel centre frequency.

NOTE 2 – This additional requirement provides for the protection of satellite systems in the bands 2 500-2 535 MHz and 2 630-2 690 MHz in Japan.

NOTE 3 – The update of the values in this Table is for further study.

3 Receiver spurious emissions (conducted)

The power of any narrow-band spurious emission should not exceed the maximum level specified in Table 39.

TABLE 39

General receiver spurious emission requirements

Band	Measurement bandwidth		Allowed emission level (dBm)
30 MHz ≤ f < 1 GHz	100 kHz		−57
1 GHz ≤ f ≤ 13.45 GHz	30 kHz	If 2.5 × BW ≤ $\lvert f_c - f \rvert$ < 10 × BW	−47
	300 kHz	If 10 × BW ≤ $\lvert f_c - f \rvert$ < 12 × BW	
	1 MHz	If 12 × BW ≤ $\lvert f_c - f \rvert$	

4 Adjacent channel leakage ratio (ACLR)

Within this Annex, and in a similar manner to other annexes, the ACLR is defined as the ratio of the on-channel transmitted power to the power transmitted in adjacent channels as measured at the output of the receiver filter. In order to measure ACLR, it is necessary to consider a measurement filter for the transmitted signal as well as a receiver measurement bandwidth for the adjacent channel (victim) system.

In this Annex, data is provided that is relevant to the case where the adjacent system is OFDMA TDD WMAN (intra-system) or the case where the adjacent system is UTRA (inter-system).

ACLR is therefore specified considering the following receiver bandwidths:

When the adjacent system is OFDMA TDD WMAN:

– 4.75 MHz for a 5 MHz channelized system, and

– 9.5 MHz for a 10 MHz channelized system.

When the adjacent system is UTRA:

– 3.84 MHz for a 5 MHz channelized system, and

– 7.68 MHz for a 10 MHz channelized system.

The measurement bandwidth for the measurement of on-channel power of the OFDMA TDD WMAN carrier is:

– 4.75 MHz for a 5 MHz channelized system, and

– 9.5 MHz for a 10 MHz channelized system.

The passband of the receiver filter is centred on the first or second adjacent channel centre frequency. In the case where the adjacent system is OFDMA TDD WAN, both the transmitted power and the received power are measured with a rectangular filter. For adjacent UTRA systems the transmitted power is measured using a rectangular filter and the received power using a RRC filter with a roll-off factor of 0.22.

The ACLR values for the two relevant cases are provided in the Tables 40 and 41.

TABLE 40

MS ACLR for 5 MHz channel bandwidth

	Minimum required ACLR relative to assigned channel frequency (dB)	
Adjacent channel centre frequency	OFDMA TDD WMAN case	UTRA[1] case
MS channel centre frequency ± 5 MHz	30	33
MS channel centre frequency ± 10 MHz	44	43

[1] These are similar to the minimum requirements for UTRA systems (see Annexes 1 and 3 to this Recommendation) and in practice may be expected to be larger.

TABLE 41

MS ACLR for 10 MHz channel bandwidth

	Minimum required ACLR relative to assigned channel frequency (dB)	
Adjacent channel centre frequency	OFDMA TDD WMAN case	UTRA[1] case
MS channel centre frequency ± 10 MHz	30	33
MS channel centre frequency ± 20 MHz	44	43

[1] These are similar to the minimum requirements for UTRA systems (see Annexes 1 and 3 to this Recommendation) and in practice may be expected to be larger.

Additional information may be provided in future revisions of this Recommendation.

NOTE 1 – Further study is necessary for other systems wherever applicable, as well as the relationship between ACLR and the emission mask.