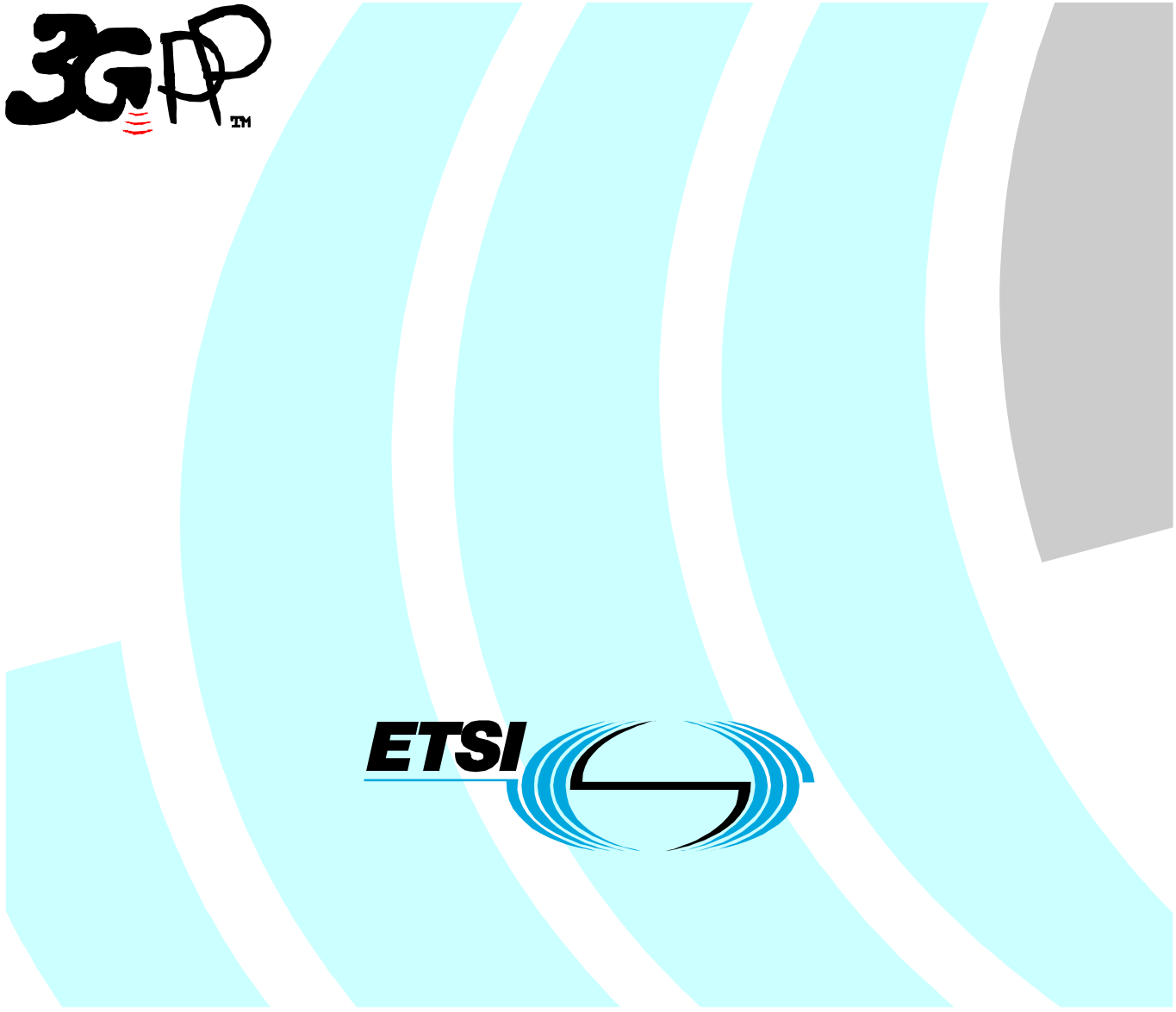
# ETSI TS 125 106 V6.5.0 (2006-10)

*Technical Specification*

**Universal Mobile Telecommunications System (UMTS);**
**UTRA repeater radio transmission and reception**
**(3GPP TS 25.106 version 6.5.0 Release 6)**



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# Foreword

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# Contents

# Foreword

This Technical Specification has been produced by the 3rd Generation Partnership Project (3GPP).

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# 1 Scope

The present document establishes the minimum radio frequency performance of UTRA repeaters.

# 2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication, edition number, version number, etc.) or non-specific.
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- For a non-specific reference, the latest version applies. In the case of a reference to a 3GPP document (including a GSM document), a non-specific reference implicitly refers to the latest version of that document *in the same Release as the present document*.

[1] ITU-R Recommendation SM.329: "Unwanted emissions in the spurious domain".

[2] 3GPP TS 25.143: "UTRA Repeater Conformance Testing".

[3] 3GPP TS 25.113: "Base Station and Repeater Electromagnetic Compatibility".

[4] ETSI ETR 273-1-2: "Electromagnetic compatibility and Radio spectrum Matters (ERM); Improvement of radiated methods of measurement (using test sites) and evaluation of the corresponding measurement uncertainties; Part 1: Uncertainties in the measurement of mobile radio equipment characteristics; Sub-part 2: Examples and annexes".

[5] 3GPP TR 25.942: "RF System Scenarios".

# 3 Definitions, symbols and abbreviations

## 3.1 Definitions

For the purposes of the present document, the following terms and definitions apply:

**Donor coupling loss:** is the coupling loss between the repeater and the donor base station.

**Down-link**: Signal path where base station transmits and mobile receives.

**Pass band:** The repeater can have one or several pass bands. The pass band is the frequency range that the repeater operates in with operational configuration. This frequency range can correspond to one or several consecutive nominal 5 MHz channels. If they are not consecutive each subset of channels shall be considered as an individual pass band.

**Repeater:** A device that receives, amplifies and transmits the radiated or conducted RF carrier both in the down-link direction (from the base station to the mobile area) and in the up-link direction (from the mobile to the base station)

**Up-link:** Signal path where mobile transmits and base station receives.

## 3.2 Symbols

(void)

## 3.3 Abbreviations

For the purposes of the present document, the following abbreviations apply:

| | |
|---|---|
| EVM | Error Vector Magnitude |
| FDD | Frequency Division Duplex |
| FFS | For Further Study |
| IMT2000 | International Mobile Telecommunication-2000 |
| ITU | International Telecommunication Union |
| RF | Radio Frequency |
| UARFCN | UTRA Absolute Radio Frequency Channel Number |
| UMTS | Universal Mobile Telecommunication System |
| UTRA | Universal Terrestrial Radio Access |
| WCDMA | Wide band Code Division Multiple Access |

# 4 General

This specification applies only to UTRA-FDD repeaters.

Unless otherwise stated, all requirements in this specification apply to both the up-link and down-link directions.

## 4.1 Relationship between Minimum Requirements and Test Requirements

The Minimum Requirements given in this specification make no allowance for measurement uncertainty. The repeater test specification 25.143 section 5 [2] defines Test Tolerances. These Test Tolerances are individually calculated for each test. The Test Tolerances are used to relax the Minimum Requirements in this specification to create Test Requirements.

The measurement results returned by the Test System are compared - without any modification - against the Test Requirements as defined by the shared risk principle.

The Shared Risk principle is defined in ETR 273 Part 1 sub-part 2 section 6.5.[4]

## 4.2 Regional requirements

Some requirements in TS 25.106 may only apply in certain regions. Table 4.1 lists all requirements that may be applied differently in different regions.

**Table 4.1: List of regional requirements.**

| Clause number | Requirement | Comments |
|---|---|---|
| 5.1 | Frequency bands | Some bands may be applied regionally. |
| 5.2 | Up-link to down-link frequency separation | The requirement is applied according to which frequency bands in Clause 5.1 that are supported by the Repeater. |
| 5.3 | Channel arrangement | The requirement is applied according to what frequency bands in clause 5.1 that are supported by the Repeater. |
| 6.1 | Maximum output power | In certain regions, the minimum requirement for normal conditions may apply also for some conditions outside the ranges of conditions defined as normal. |
| 9.1.1 | Spectrum emission mask | The mask specified may be mandatory in certain regions. In other regions this mask may not be applied. |
| 9.2.1.1 | Spurious emissions (Category A) | These requirements shall be met in cases where Category A limits for spurious emissions, as defined in ITU-R Recommendation SM.329 [1], are applied. |
| 9.2.1.2 | Spurious emissions (Category B) | These requirements shall be met in cases where Category B limits for spurious emissions, as defined in ITU-R Recommendation SM.329 [1], are applied. |
| 9.2.2 | Protection of the BS receiver in the operating band | This requirement may be applied for the protection of UTRA FDD BS receivers in geographic areas in which both UTRA FDD BS and UTRA FDD Repeaters are deployed. |
| 9.2.3 | Co-existence with other systems in the same geographical area | These requirements may apply in geographic areas in which both UTRA FDD Repeater and GSM900 DCS1800, PCS1900, GSM850 and/or UTRA FDD operating in another frequency band are deployed. |
| 9.2.4 | Co-existence with co-located and co-sited base stations | These requirements may be applied for the protection of other BS receivers when GSM900 DCS1800, PCS1900, GSM850 and/or FDD BS operating in another frequency band are co-located with a UTRA FDD Repeater. |
| 9.2.5 | Spurious emissions: Co-existence with PHS | This requirement may be applied for the protection of PHS in geographic areas in which both PHS and UTRA FDD Repeaters are deployed. |
| 9.2.6.1 | Spurious emissions: Co-existence with UTRA TDD–Operation in the same geographic area | This requirement may be applied for the protection of UTRA UE in geographic areas in which both UTRA TDD BS and UTRA FDD Repeaters are deployed. |
| 9.2.6.2 | Spurious emissions: Co-existence with UTRA TDD - Co-location | This requirement may be applied for the protection of UTRA TDD BS receivers when UTRA TDD BS and UTRA FDD Repeaters are co-located. |
| 9.2.7 | Co-.existence with services in adjacent frequency bands | This requirement may be applied for the protection in bands adjacent to the downlink band as defined in clause 5.1 in geographic areas in which both an adjacent band service and UTRA FDD Repeater are deployed. |
| 11.2 | Input Intermodulation: Co-location with other systems | The requirement may be applied when GSM900, DCS1800, PCS1900, GSM850 and/or UTRA FDD BS operating in another frequency band and UTRA-FDD Repeaters are co-located. |
| 11.3 | Input Intermodulation: Co-existence with other systems | These requirements may apply in geographic areas in which both UTRA FDD Repeater and GSM900, DCS1800, PCS1900, GSM850 and/or UTRA FDD operating in another frequency band are deployed. |

# 5 Frequency bands and channel arrangement

## 5.1 Frequency bands

a) A UTRA/FDD Repeater is designed to operate in one or several pass bands within either of the following paired frequency bands;

**Table 5.1: Frequency bands**

| Operating Band | UL Frequencies UE transmit, Node B receive | DL frequencies UE receive, Node B transmit |
|---|---|---|
| I | 1920 – 1980 MHz | 2110 –2170 MHz |
| II | 1850 –1910 MHz | 1930 –1990 MHz |
| III | 1710 – 1785 MHz | 1805 – 1880 MHz |
| IV | 1710 – 1755 MHz | 2110 – 2155 MHz |
| V | 824 – 849MHz | 869 – 894MHz |
| VI | 830 – 840 MHz | 875 – 885 MHz |

b) Deployment in other frequency bands is not precluded.

## 5.2 TX - RX frequency separation

a) A UTRA/FDD repeaters is designed to operate with the following TX to RX frequency separation

**Table 5.2: TX–RX frequency separation**

| Operating Band | TX-RX frequency separation |
|---|---|
| I | 190 MHz |
| II | 80 MHz. |
| III | 95 MHz |
| IV | 400 MHz |
| V | 45 MHz |
| VI | 45 MHz |

b) A UTRA/FDD repeater can support both fixed and variable up-link to down-link frequency separation.

c) The use of other up-link to down-link frequency separations in existing or other frequency bands shall not be precluded.

## 5.3 Channel arrangement

### 5.3.1 Channel spacing

The nominal channel spacing is 5 MHz, but this can be adjusted to optimise performance in a particular deployment scenario.

### 5.3.2 Channel raster

The channel raster is 200 kHz for all bands, which means that the centre frequency must be an integer multiple of 200 kHz. In addition, a number of additional centre frequencies are specified according to the table 5.3, which means that and the centre frequencies for these channels are shifted 100 kHz relative to the general raster.

### 5.3.3 Channel number

The carrier frequency is designated by the UTRA Absolute Radio Frequency Channel Number (UARFCN).

For each operating band, the UARFCN values are defined as follows.

Uplink: $N_U = 5 * (F_{UL} - F_{UL\_Offset})$, for the carrier frequency range $F_{UL\_low} \le F_{UL} \le F_{UL\_high}$

Downlink: $N_D = 5 * (F_{DL} - F_{DL\_Offset})$, for the carrier frequency range $F_{DL\_low} \le F_{DL} \le F_{DL\_high}$

For each operating Band, $F_{UL\_Offset}$, $F_{UL\_low}$, $F_{UL\_high}$, $F_{DL\_Offset}$,, $F_{DL\_low}$ and $F_{DL\_high}$ are defined in Table 5.3 for the general UARFCN. For the additional UARFCN, $F_{UL\_Offset}$, $F_{DL\_Offset}$ and the specific $F_{UL}$ and $F_{DL}$ are defined in Table 5.4.

**Table 5.3: UARFCN definition (general)**

| Band | UPLINK (UL) UE transmit, Node B receive | | | DOWNLINK (DL) UE receive, Node B transmit | | |
|---|---|---|---|---|---|---|
| | UARFCN formula offset $F_{UL\_Offset}$ [MHz] | Carrier frequency ($F_{UL}$) range [MHz] | | UARFCN formula offset $F_{DL\_Offset}$ [MHz] | Carrier frequency ($F_{DL}$) range [MHz] | |
| | | $F_{UL\_low}$ | $F_{UL\_high}$ | | $F_{DL\_low}$ | $F_{DL\_high}$ |
| I | 0 | 1922.4 | 1977.6 | 0 | 2112.4 | 2167.6 |
| II | 0 | 1852.4 | 1907.6 | 0 | 1932.4 | 1987.6 |
| III | 1525 | 1712.4 | 1782.6 | 1575 | 1807.4 | 1877.6 |
| IV | 1450 | 1712.4 | 1752.6 | 1805 | 2112.4 | 2152.6 |
| V | 0 | 826.4 | 846.6 | 0 | 871.4 | 891.6 |
| VI | 0 | 832.4 | 837.6 | 0 | 877.4 | 882.6 |

**Table 5.4: UARFCN definition (additional channels)**

| Band | UPLINK (UL) UE transmit, Node B receive | | DOWNLINK (DL) UE receive, Node B transmit | |
|---|---|---|---|---|
| | UARFCN formula offset $F_{UL\_Offset}$ [MHz] | Carrier frequency [MHz] ($F_{UL}$) | UARFCN formula offset $F_{DL\_Offset}$ [MHz] | Carrier frequency [MHz] ($F_{DL}$) |
| I | - | - | - | - |
| II | 1850.1 | 1852.5, 1857.5, 1862.5, 1867.5, 1872.5, 1877.5, 1882.5, 1887.5, 1892.5, 1897.5, 1902.5, 1907.5 | 1850.1 | 1932.5, 1937.5, 1942.5, 1947.5, 1952.5, 1957.5, 1962.5, 1967.5, 1972.5, 1977.5, 1982.5, 1987.5 |
| III | - | - | - | - |
| IV | 1380.1 | 1712.5, 1717.5, 1722.5, 1727.5, 1732.5, 1737.5 1742.5, 1747.5, 1752.5 | 1735.1 | 2112.5, 2117.5, 2122.5, 2127.5, 2132.5, 2137.5, 2142.5, 2147.5, 2152.5 |
| V | 670.1 | 826.5, 827.5, 831.5, 832.5, 837.5, 842.5 | 670.1 | 871.5, 872.5, 876.5, 877.5, 882.5, 887.5 |
| VI | 670.1 | 832.5, 837.5 | 670.1 | 877.5, 882.5 |

# 6 Output power

Output power, Pout, of the repeater is the mean power of one carrier at maximum repeater gain delivered to a load with resistance equal to the nominal load impedance of the transmitter.

Rated output power, PRAT, of the repeater is the mean power level per carrier at maximum repeater gain that the manufacturer has declared to be available at the antenna connector.

## 6.1 Maximum output power

Maximum output power, Pmax, of the repeater is the mean power level per carrier measured at the antenna connector in specified reference condition.

### 6.1.1 Minimum Requirements

The requirements shall apply at maximum gain, with WCDMA signals in the pass band of the repeater, at levels that produce the maximum rated output power per channel.

When the power of all signals is increased by 10 dB, compared to the power level that produce the maximum rated output power, the requirements shall still be met.

In normal conditions, the Repeater maximum output power shall remain within limits specified in Table 6.1 relative to the manufacturer's rated output power.

**Table 6.1: Repeater output power; normal conditions**

| Rated output power | Limit |
|---|---|
| P ≥ 43 dBm | +2 dB and -2 dB |
| 39 ≤ P < 43 dBm | +2 dB and -2 dB |
| 31 ≤ P < 39 dBm | +2 dB and -2 dB |
| P < 31 dBm | +3 dB and -3 dB |

In extreme conditions, the Repeater maximum output power shall remain within the limits specified in Table 6.2 relative to the manufacturer's rated output power.

**Table 6.2: Repeater output power; extreme conditions**

| Rated output power | Limit |
|---|---|
| P ≥ 43 dBm | +2,5 dB and -2,5 dB |
| 39 ≤ P < 43 dBm | +2,5 dB and -2,5 dB |
| 31 ≤ P < 39 dBm | +2,5 dB and -2,5 dB |
| P < 31 dBm | +4 dB and -4 dB |

In certain regions, the minimum requirement for normal conditions may apply also for some conditions outside the ranges of conditions defined as normal.

# 7 Frequency stability

Frequency stability is the ability to maintain the same frequency on the output signal with respect to the input signal.

## 7.1 Minimum requirement

The frequency deviation of the output signal with respect to the input signal shall be no more than ±0,01 ppm.

# 8 Out of band gain

Out of band gain refers to the gain of the repeater outside the pass band.

## 8.1 Minimum requirement

The intended use of a repeater in a system is to amplify the in band signals and not to amplify the out of band emission of the donor base station.
In the intended application of the repeater, the out of band gain is less than the donor coupling loss.

The repeater minimum donor coupling loss shall be declared by the manufacturer. This is this the minimum required attenuation between the donor BS and the repeater for proper repeater operation.

The gain outside the pass band shall not exceed the maximum level specified in table 8.1, where:

- f_offset is the distance from the centre frequency of the first or last 5 MHz channel within the pass band.

**Table 8.1: Out of band gain limits 1**

| Frequency offset from the carrier frequency, f_offset | Maximum gain |
|---|---|
| 2,7 ≤ f_offset < 3,5 MHz | 60 dB |
| 3,5 ≤ f_offset < 7,5 MHz | 45 dB |
| 7,5 ≤ f_offset < 12,5 MHz | 45 dB |
| 12,5 MHz ≤ f_offset | 35 dB |

For 12,5 MHz ≤ f_offset the out of band gain shall not exceed the maximum gain of table 8.2 or the maximum gain stated in table 8.1 whichever is lower.

**Table 8.2: Out of band gain limits 2**

| Repeater maximum output power as in 9.1.1.1 | Maximum gain |
|---|---|
| P < 31 dBm | Out of band gain ≤ minimum donor coupling loss |
| 31 dBm ≤ P < 43 dBm | Out of band gain ≤ minimum donor coupling loss |
| P ≥ 43 dBm | Out of band gain ≤ minimum donor coupling loss – (P-43dBm) |
| Note 1: The out of band gain is considered with 12,5 MHz ≤ f_offset | |

# 9 Unwanted emission

## 9.1 Out of band emission

Out of band emissions are unwanted emissions immediately outside the pass band resulting from the modulation process and non-linearity in the transmitter but excluding spurious emissions. This out of band emission requirement is specified in terms of a spectrum emission mask.

### 9.1.1 Spectrum emission mask

The mask defined in tables 9.1 to 9.4 below may be mandatory in certain regions. In other regions this mask may not be applied.

For regions where this clause applies, the requirement shall be met by a repeater's RF-signal output at maximum gain with WCDMA signals in the pass band of the repeater, at levels that produce the maximum rated output power per channel. The requirements shall also apply at maximum gain without WCDMA signals in the pass band.

Emissions shall not exceed the maximum level specified in tables 9.1 to 9.4 for the appropriate repeater maximum output power, in the frequency range from $\Delta f$ = 2,5 MHz to $\Delta f_{max}$ from the 5 MHz channel, where:

- $\Delta f$ is the separation between the centre frequency of first or last 5 MHz channel used in the pass band and the nominal –3 dB point of the measuring filter closest to the carrier frequency.

- f_offset is the separation between the centre frequency of first or last 5 MHz channel in the pass band and the centre of the measuring filter.

- $f\_offset_{max}$ is either 12,5 MHz or the offset to the UTRA band edge at both up- and down-link as defined in section 5.1, whichever is the greater.

- $\Delta f_{max}$ is equal to $f\_offset_{max}$ minus half of the bandwidth of the measurement filter.

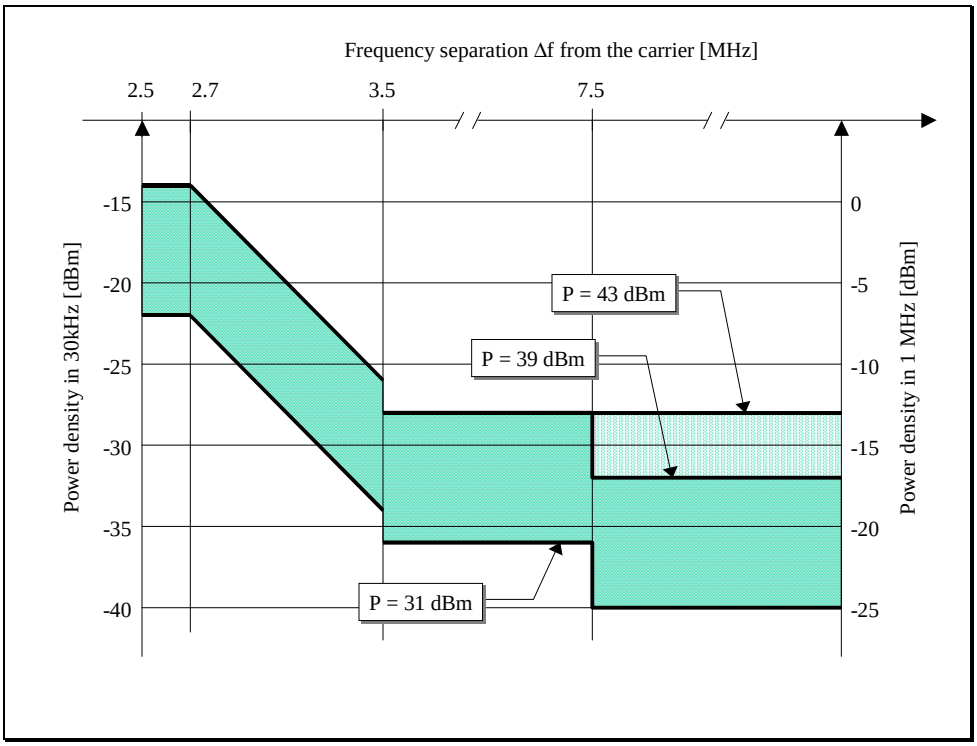


**Figure 9.1: Illustrative diagram of spectrum emission mask**

**Table 9.1: Spectrum emission mask values, maximum output power P ≥ 43 dBm**

| Frequency offset of measurement filter – 3dB point, Δf | Frequency offset of measurement filter centre frequency, f_offset | Minimum requirement Band I, II, III, IV, V | Additional Requirements Band II, IV and V (Note 1) | Measurement bandwidth |
|---|---|---|---|---|
| 2,5 MHz ≤ Δf < 2,7 MHz | 2,515MHz ≤ f_offset < 2,715MHz | -14 dBm | -15 dBm | 30 kHz |
| 2,7 MHz ≤ Δf < 3,5 MHz | 2,715MHz ≤ f_offset < 3,515MHz | $-14\text{dBm} - 15 \cdot \left( \frac{\text{f\_offset}}{\text{MHz}} - 2{,}715 \right) \text{dB}$ | -15 dBm | 30 kHz |
| (see note 2) | 3,515MHz ≤ f_offset < 4,0MHz | -26 dBm | NA | 30 kHz |
| 3,5 MHz ≤ Δf ≤ $f_{max}$ | 4,0MHz ≤ f_offset < $f\_offset_{max}$ | -13 dBm | -13 dBm | 1 MHz |

**Table 9.2: Spectrum emission mask values, maximum output power 39 ≤ P < 43 dBm**

| Frequency offset of measurement filter – 3dB point, Δf | Frequency offset of measurement filter centre frequency, f_offset | Minimum requirement Band I, II, III, IV, V | Additional Requirements Band II, IV and V (Note 1) | Measurement bandwidth |
|---|---|---|---|---|
| 2,5 MHz ≤ Δf < 2,7 MHz | 2,515MHz ≤ f_offset < 2,715MHz | -14 dBm | -15 dBm | 30 kHz |
| 2,7 MHz ≤ Δf < 3,5 MHz | 2,715MHz ≤ f_offset < 3,515MHz | $-14\text{dBm} - 15 \cdot \left( \frac{\text{f\_offset}}{\text{MHz}} - 2{,}715 \right) \text{dB}$ | -15 dBm | 30 kHz |
| (see note) | 3,515MHz ≤ f_offset < 4,0MHz | -26 dBm | NA | 30 kHz |
| 3,5 MHz ≤ Δf < 7,5 MHz | 4,0MHz ≤ f_offset < 8,0MHz | -13 dBm | -13 dBm | 1 MHz |
| 7,5 MHz ≤ Δf ≤ $f_{max}$ | 8,0MHz ≤ f_offset < $f\_offset_{max}$ | P - 56 dB | -13 dBm | 1 MHz |

**Table 9.3: Spectrum emission mask values, maximum output power 31 ≤ P < 39 dBm**

| Frequency offset of measurement filter – 3dB point,Δf | Frequency offset of measurement filter centre frequency, f_offset | Minimum requirement Band I, II, III, IV, V | Additional Requirements Band II, IV and V (Note 1) | Measurement bandwidth |
|---|---|---|---|---|
| 2,5 MHz ≤ Δf < 2,7 MHz | 2,515MHz ≤ f_offset < 2,715MHz | P - 53 dB | -15 dBm | 30 kHz |
| 2,7 MHz ≤ Δf < 3,5 MHz | 2,715MHz ≤ f_offset < 3,515MHz | $P - 53\text{dB} - 15 \cdot \left( \frac{\text{f\_offset}}{\text{MHz}} - 2{,}715 \right) \text{dB}$ | -15 dBm | 30 kHz |
| (see note) | 3,515MHz ≤ f_offset < 4,0MHz | P-65 dB | NA | 30 kHz |
| 3,5 MHz ≤ Δf < 7,5 MHz | 4,0MHz ≤ f_offset < 8,0MHz | P - 52 dB | -13 dBm | 1 MHz |
| 7,5 MHz ≤ Δf ≤ $f_{max}$ | 8,0MHz ≤ f_offset < $f\_offset_{max}$ | P - 56 dB | -13 dBm | 1 MHz |

**Table 9.4: Spectrum emission mask values, maximum output power P < 31 dBm**

| Frequency offset of measurement filter – 3dB point, Δf | Frequency offset of measurement filter centre frequency, f_offset | Minimum requirement Band I, II, III, IV, V | Measurement bandwidth |
|---|---|---|---|
| 2,5 MHz ≤ Δf < 2,7 MHz | 2,515MHz ≤ f_offset < 2,715MHz | -22 dBm | 30 kHz |
| 2,7 MHz ≤ Δf < 3,5 MHz | 2,715MHz ≤ f_offset < 3,515MHz | $-22\text{dBm} - 15 \cdot \left( \frac{\text{f\_offset}}{\text{MHz}} - 2{,}715 \right) \text{dB}$ | 30 kHz |
| (see note 2) | 3,515MHz ≤ f_offset < 4,0MHz | -34 dBm | 30 kHz |
| 3,5 MHz ≤ Δf < 7,5 MHz | 4,0MHz ≤ f_offset < 8,0MHz | -21 dBm | 1 MHz |
| 7,5 MHz ≤ Δf ≤ $f_{max}$ | 8,0MHz ≤ f_offset < $f\_offset_{max}$ | -25 dBm | 1 MHz |

Note for Tables 9.1, 9.2, 9.3 & 9.4

NOTE 1 The minimum requirement for operation in band II, IV and V is the lower power of the minimum requirement for band I, II, III, IV and V and the additional requirement for band II, IV and V.

NOTE 2: This frequency range ensures that the range of values of f_offset is continuous.

# 9.2 Spurious emissions

Spurious emissions are emissions which are caused by unwanted transmitter effects such as harmonics emission, parasitic emission, intermodulation products and frequency conversion products, but exclude out of band emissions. This is measured at the repeaters RF output port.

Either requirement applies at frequencies within the specified frequency ranges that are more than 12,5 MHz below the centre frequency of the first 5 MHz channel or more than 12,5 MHz above the centre frequency of the last 5 MHz channel in the pass band.

Unless otherwise stated, all requirements are measured as mean power.

## 9.2.1 General Requirements

The requirements of either subclause 9.2.1.1 or subclause 9.2.1.2 shall apply whatever the type of repeater considered (one or several pass bands). It applies for all configurations foreseen by the manufacturer"s specification.

### 9.2.1.1 Minimum Requirement (Category A)

The following requirements shall be met in cases where Category A limits for spurious emissions, as defined in ITU-R Recommendation SM.329 [1], are applied.

At maximum repeater gain, with WCDMA signals in the pass band of the repeater, at levels that produce the maximum rated output power per channel, the power of any spurious emission shall not exceed the limits specified in table 9.5. The requirements shall also apply at maximum gain without WCDMA signals in the pass band.

When the power in all channels is increased by 10 dB, compared to the input level producing the maximum rated output power, the requirement shall still be met.

**Table 9.5: Up-link and down-link: General spurious emissions limits, Category A**

| Band | Maximum level | Measurement Bandwidth | Note |
|---|---|---|---|
| 9kHz – 150kHz | -13 dBm | 1 kHz | Bandwidth as in ITU-R SM.329 [1], s4.1 |
| 150kHz – 30MHz | | 10 kHz | Bandwidth as in ITU-R SM.329 [1], s4.1 |
| 30MHz – 1GHz | | 100 kHz | Bandwidth as in ITU-R SM.329 [1], s4.1 |
| 1GHz – 12,75 GHz | | 1 MHz | Upper frequency as in ITU-R SM.329 [1], s2.5 table 1 |

### 9.2.1.2 Minimum Requirement (Category B)

The following requirements shall be met in cases where Category B limits for spurious emissions, as defined in ITU-R Recommendation SM.329 [1], are applied.

At maximum repeater gain, with WCDMA signals in the pass band of the repeater, at levels that produce the maximum rated power output per channel, the power of any spurious emission shall not exceed the limits specified in tables 9.6, 9.6A, 9.6B, 9.6C and 9.6D for the down- and up-link.

The requirements shall also apply at maximum gain without WCDMA signals in the pass band.

When the power in all channels is increased by 10 dB, compared to the input level producing the maximum rated output power, the requirement shall still be met.

**Table 9.6: General spurious emissions limits, operating band I, Category B**

| Up-link Band | Down-link Band | Maximum Level | Measurement Bandwidth | Note |
|---|---|---|---|---|
| 9kHz ↔ 150kHz | 9kHz ↔ 150kHz | -36 dBm | 1 kHz | Note 1 |
| 150kHz ↔ 30MHz | 150kHz ↔ 30MHz | - 36 dBm | 10 kHz | Note 1 |
| 30MHz ↔ 1GHz | 30MHz ↔ 1GHz | -36 dBm | 100 kHz | Note 1 |
| 1GHz<br>↔<br>Fc1 - 60 MHz or 1910 MHz<br>whichever is the higher | 1GHz<br>↔<br>Fc1 - 60 MHz or 2100 MHz<br>*whichever is the higher* | -30 dBm | 1 MHz | Note 1 |
| Fc1 – 60 MHz or 1910 MHz<br>whichever is the higher<br>↔<br>Fc1 – 50 MHz or 1910 MHz<br>whichever is the higher | Fc1 – 60 MHz or 2100 MHz<br>*whichever is the higher*<br>↔<br>Fc1 – 50 MHz or 2100 MHz<br>*whichever is the higher* | -25 dBm | 1 MHz | Note 2 |
| Fc1 – 50 MHz or 1910 MHz<br>whichever is the higher<br>↔<br>Fc2 + 50 MHz or 1990 MHz<br>whichever is the lower | Fc1 – 50 MHz or 2100 MHz<br>*whichever is the higher*<br>↔<br>Fc2 + 50 MHz or 2180 MHz<br>*whichever is the lower* | -15 dBm | 1 MHz | Note 2 |
| Fc2 + 50 MHz or 1990 MHz<br>whichever is the lower<br>↔<br>Fc2 + 60 MHz or 1990 MHz<br>whichever is the lower | Fc2 + 50 MHz or 2180 MHz<br>*whichever is the lower*<br>↔<br>Fc2 + 60 MHz or 2180 MHz<br>*whichever is the lower* | -25 dBm | 1 MHz | Note 2 |
| Fc2 + 60 MHz or 1990 MHz<br>whichever is the lower<br>↔<br>12,75 GHz | Fc2 + 60 MHz or 2180 MHz<br>*whichever is the lower*<br>↔<br>12,75 GHz | -30 dBm | 1 MHz | Note 3 |

NOTE 1: Bandwidth as in ITU-R SM.329 [4], s4.1
NOTE 2: Specification in accordance with ITU-R SM.329 [4], s4.3 and Annex 7
NOTE 3: Bandwidth as in ITU-R SM.329 [4], s4.1. Upper frequency as in ITU-R SM.329 [4], s2.5 table 1

**Table 9.6A: General spurious emissions limits, operating band II, Category B**

| Up-link Band | Down-link Band | Maximum Level | Measurement Bandwidth | Note |
|---|---|---|---|---|
| 9kHz ↔ 150kHz | 9kHz ↔ 150kHz | -36 dBm | 1 kHz | Note 1 |
| 150kHz ↔ 30MHz | 150kHz ↔ 30MHz | - 36 dBm | 10 kHz | Note 1 |
| 30MHz ↔ 1GHz | 30MHz ↔ 1GHz | -36 dBm | 100 kHz | Note 1 |
| 1GHz<br>↔<br>Fc1 - 60 MHz or 1840 MHz<br>*whichever is the higher* | 1GHz<br>↔<br>Fc1 - 60 MHz or 1920 MHz<br>whichever is the higher | -30 dBm | 1 MHz | Note 1 |
| Fc1 – 60 MHz or 1840 MHz<br>*whichever is the higher*<br>↔<br>Fc1 – 50 MHz or 1840 MHz<br>*whichever is the higher* | Fc1 – 60 MHz or 1920 MHz<br>whichever is the higher<br>↔<br>Fc1 – 50 MHz or 1920 MHz<br>whichever is the higher | -25 dBm | 1 MHz | Note 2 |
| Fc1 – 50 MHz or 1840 MHz<br>*whichever is the higher*<br>↔<br>Fc2 + 50 MHz or 1920 MHz<br>*whichever is the lower* | Fc1 – 50 MHz or 1920 MHz<br>whichever is the higher<br>↔<br>Fc2 + 50 MHz or 2000 MHz<br>whichever is the lower | -15 dBm | 1 MHz | Note 2 |
| Fc2 + 50 MHz or 1920 MHz<br>*whichever is the lower*<br>↔<br>Fc2 + 60 MHz or 1920 MHz<br>*whichever is the lower* | Fc2 + 50 MHz or 2000 MHz<br>whichever is the lower<br>↔<br>Fc2 + 60 MHz or 2000 MHz<br>whichever is the lower | -25 dBm | 1 MHz | Note 2 |
| Fc2 + 60 MHz or 1920 MHz<br>*whichever is the lower*<br>↔<br>12,75 GHz | Fc2 + 60 MHz or 2000 MHz<br>whichever is the lower<br>↔<br>12,75 GHz | -30 dBm | 1 MHz | Note 3 |
| NOTE 1: Bandwidth as in ITU-R SM.329 [4], s4.1<br>NOTE 2: Specification in accordance with ITU-R SM.329 [4], s4.3 and Annex 7<br>NOTE 3: Bandwidth as in ITU-R SM.329 [4], s4.1. Upper frequency as in ITU-R SM.329 [4], s2.5 table 1 | | | | |

**Table 9.6B: General spurious emissions limits, operating band III, Category B**

| Up-link Band | Down-link Band | Maximum Level | Measurement Bandwidth | Note |
|---|---|---|---|---|
| 9kHz ↔ 150kHz | 9kHz ↔ 150kHz | -36 dBm | 1 kHz | Note 1 |
| 150kHz ↔ 30MHz | 150kHz ↔ 30MHz | -36 dBm | 10 kHz | Note 1 |
| 30MHz ↔ 1GHz | 30MHz ↔ 1GHz | -36 dBm | 100 kHz | Note 1 |
| 1GHz<br>↔<br>Fc1 - 60 MHz or 1700 MHz whichever is the higher | 1GHz<br>↔<br>Fc1 - 60 MHz or 1795 MHz whichever is the higher | -30 dBm | 1 MHz | Note 1 |
| Fc1 – 60 MHz or 1700 MHz whichever is the higher<br>↔<br>Fc1 – 50 MHz or 1700 MHz whichever is the higher | Fc1 – 60 MHz or 1795 MHz whichever is the higher<br>↔<br>Fc1 – 50 MHz or 1795 MHz whichever is the higher | -25 dBm | 1 MHz | Note 2 |
| Fc1 – 50 MHz or 1700 MHz whichever is the higher<br>↔<br>Fc2 + 50 MHz or 1795 MHz whichever is the lower | Fc1 – 50 MHz or 1795 MHz whichever is the higher<br>↔<br>Fc2 + 50 MHz or 1890 MHz whichever is the lower | -15 dBm | 1 MHz | Note 2 |
| Fc2 + 50 MHz or 1795 MHz whichever is the lower<br>↔<br>Fc2 + 60 MHz or 1795 MHz whichever is the lower | Fc2 + 50 MHz or 1890 MHz whichever is the lower<br>↔<br>Fc2 + 60 MHz or 1890 MHz whichever is the lower | -25 dBm | 1 MHz | Note 2 |
| Fc2 + 60 MHz or 1795 MHz whichever is the lower<br>↔<br>12,75 GHz | Fc2 + 60 MHz or 1890 MHz whichever is the lower<br>↔<br>12,75 GHz | -30 dBm | 1 MHz | Note 3 |
| NOTE 1: Bandwidth as in ITU-R SM.329 [4], s4.1<br>NOTE 2: Specification in accordance with ITU-R SM.329 [4], s4.3 and Annex 7<br>NOTE 3: Bandwidth as in ITU-R SM.329 [4], s4.1. Upper frequency as in ITU-R SM.329 [4], s2.5 table 1 | | | | |

**Table 9.6C: General spurious emissions limits, operating band IV, Category B**

| Up-link Band | Down-link Band | Maximum Level | Measurement Bandwidth | Note |
|---|---|---|---|---|
| 9kHz ↔ 150kHz | 9kHz ↔ 150kHz | -36 dBm | 1 kHz | Note 1 |
| 150kHz ↔ 30MHz | 150kHz ↔ 30MHz | -36 dBm | 10 kHz | Note 1 |
| 30MHz ↔ 1GHz | 30MHz ↔ 1GHz | -36 dBm | 100 kHz | Note 1 |
| 1GHz ↔ 1700 MHz | 1GHz ↔ 2100 MHz | -30 dBm | 1 MHz | Note 1 |
| 1700 MHz ↔ Fc1 – 50 MHz or 1700 MHz whichever is the higher | 2100 MHz ↔ Fc1 – 50 MHz or 2100 MHz whichever is the higher | -25 dBm | 1 MHz | Note 2 |
| Fc1 – 50 MHz or 1700 MHz whichever is the higher ↔ Fc2 + 50 MHz or 1765 MHz whichever is the lower | Fc1 – 50 MHz or 2100 MHz whichever is the higher ↔ Fc2 + 50 MHz or 2165 MHz whichever is the lower | -15 dBm | 1 MHz | Note 2 |
| Fc2 + 50 MHz or 1765 MHz whichever is the lower ↔ 1765 MHz | Fc2 + 50 MHz or 2165 MHz whichever is the lower ↔ 2165 MHz | -25 dBm | 1 MHz | Note 2 |
| 1765 MHz ↔ 12,75 GHz | 2165 MHz ↔ 12,75 GHz | -30 dBm | 1 MHz | Note 3 |
| NOTE 1: Bandwidth as in ITU-R SM.329 [4], s4.1<br>NOTE 2: Specification in accordance with ITU-R SM.329 [4], s4.3 and Annex 7<br>NOTE 3: Bandwidth as in ITU-R SM.329 [4], s4.1. Upper frequency as in ITU-R SM.329 [4], s2.5 table 1 | | | | |

**Table 9.6D: General spurious emissions limits, operating band V, Category B**

| Up-link Band | Down-link Band | Maximum Level | Measurement Bandwidth | Note |
|---|---|---|---|---|
| 9kHz ↔ 150kHz | 9kHz ↔ 150kHz | -36 dBm | 1 kHz | Note 1 |
| 150kHz ↔ 30MHz | 150kHz ↔ 30MHz | -36 dBm | 10 kHz | Note 1 |
| 30MHz ↔ 814MHz | 30MHz ↔ 859MHz | -36 dBm | 100 kHz | Note 1 |
| 814MHz ↔ Fc1 - 20 MHz or 814 MHz whichever is the higher | 859MHz ↔ Fc1 - 20 MHz or 859 MHz whichever is the higher | -26 dBm | 100 kHz | Note 2 |
| Fc1 - 20 MHz or 814 MHz whichever is the higher ↔ Fc2 + 20 MHz or 859 MHz whichever is the lower | Fc1 - 20 MHz or 859 MHz whichever is the higher ↔ Fc2 + 20 MHz or 904 MHz whichever is the lower | -16 dBm | 100 kHz | Note 2 |
| Fc2 + 20 MHz or 859 MHz whichever is the lower ↔ 859 MHz | Fc2 + 20 MHz or 904 MHz whichever is the lower ↔ 904 MHz | -26 dBm | 100 kHz | Note 2 |
| 859 MHz ↔ 1GHz | 904 MHz ↔ 1GHz | -36 dBm | 100 kHz | Note 3 |
| 1 GHz ↔ 12,75 GHz | 1 GHz ↔ 12,75 GHz | -30 dBm | 1 MHz | Note 3 |
| NOTE 1: Bandwidth as in ITU-R SM.329 [4], s4.1<br>NOTE 2: Specification in accordance with ITU-R SM.329 [4], s4.3 and Annex 7<br>NOTE 3: Bandwidth as in ITU-R SM.329 [4], s4.1. Upper frequency as in ITU-R SM.329 [4], s2.5 table 1 | | | | |

Fc1: Centre frequency of emission of the first 5 MHz channel in a pass band.

Fc2: Centre frequency of emission of the last 5 MHz channel in a pass band.

## 9.2.2 Protection of BS receiver in the operating band

This requirement shall be applied for the protection of UTRA-FDD BS receivers in geographic areas in which UTRA-FDD Repeater and UTRA-FDD BS are deployed.

### 9.2.2.1 Minimum Requirement

In the up-link direction of the Repeater the power of any spurious emission shall not exceed:

**Table 9.7A: UTRA Repeater up-link spurious emissions limits for protection of UTRA FDD BS receiver for the up-link direction of the Repeater**

| Operating band | Band | Maximum Level | Measurement Bandwidth | Note |
|---|---|---|---|---|
| I | 1920 – 1980 MHz | -53 dBm | 100 kHz | |
| II | 1850 - 1910 MHz | -53 dBm | 100 kHz | |
| III | 1710 - 1785 MHz | -53 dBm | 100 kHz | |
| IV | 1710 - 1755 MHz | -53 dBm | 100 kHz | |
| V | 824 - 849 MHz | -53 dBm | 100 kHz | |
| VI | 815 - 850 MHz | -53 dBm | 100 kHz | |

NOTE 1: These requirements in Table 9.7A for the up-link direction of the Repeater reflect what can be achieved with present state of the art technology and are based on a coupling loss of 73 dB between a Repeater and a UTRA FDD BS receiver.

NOTE 2: The requirements shall be reconsidered when the state of the art technology progresses.

## 9.2.3 Co-existence with other systems in the same geographical area

These requirements may be applied for the protection of UE, MS and/or BS operating in other frequency bands in the same geographical area. The requirements may apply in geographic areas in which both UTRA FDD Repeater operating in frequency bands I to VI and a system operating in another frequency band than the FDD operating band are deployed. The system operating in the other frequency band may be GSM900, DCS1800, PCS1900, GSM850 and/or FDD operating in bands I to VI.

### 9.2.3.1 Minimum Requirements

The power of any spurious emission shall not exceed the limits of Table 9.9 for a UTRA FDD Repeater where requirements for co-existence with the system listed in the first column apply.

**Table 9.9: UTRA Repeater up-link and down-link spurious emissions limits in geographic coverage area of systems operating in other frequency bands**

| System type operating in the same geographical area | Band for co-existence requirement | Maximum Level | Measurement Bandwidth | Note |
|---|---|---|---|---|
| GSM900 | 921 - 960 MHz | -57 dBm | 100 kHz | |
| | 876 – 915 MHz | -61 dBm | 100 kHz | |
| DCS1800 | 1805 - 1880 MHz | -47 dBm | 100 kHz | This requirement does not apply to UTRA FDD Repeater operating in band III. |
| | 1710 – 1785 MHz | -61 dBm | 100 kHz | This requirement does not apply to the up-link of the UTRA FDD Repeater operating in band III, since it is already covered by the band III requirement in sub-clause 9.2.2. |
| PCS1900 | 1930 - 1990 MHz | -47 dBm | 100 kHz | This requirement does not apply to UTRA FDD Repeater operating in frequency band II. |
| | 1850 - 1910 MHz | -61 dBm | 100 kHz | This requirement does not apply to the up-link of the UTRA FDD Repeater operating in frequency band II, since it is already covered by the band II requirement in sub-clause 9.2.2. |
| GSM850 | 869 – 894 MHz | -57 dBm | 100 kHz | This requirement does not apply to UTRA FDD Repeater operating in frequency band V. |
| | 824 - 849 MHz | -61 dBm | 100 kHz | This requirement does not apply to the up-link of the UTRA FDD Repeater operating in frequency band V, since it is already covered by the band V requirement in sub-clause 9.2.2. |
| FDD Band I | 2110 – 2170 MHz | -52 dBm | 1 MHz | This requirement does not apply to UTRA FDD Repeater operating in band I. |
| | 1920 – 1980 MHz | -49 dBm | 1 MHz | This requirement does not apply to the up-link of the UTRA FDD Repeater operating in band I, since it is already covered by the band I requirement in sub-clause 9.2.2. |
| FDD Band II | 1930 – 1990 MHz | -52 dBm | 1 MHz | This requirement does not apply to UTRA FDD Repeater operating in band II. |
| | 1850 – 1910 MHz | -49 dBm | 1 MHz | This requirement does not apply to the up-link of the UTRA FDD Repeater operating in band II, since it is already covered by the band II requirement in sub-clause 9.2.2. |
| FDD Band III | 1805 – 1880 MHz | -52 dBm | 1 MHz | This requirement does not apply to UTRA FDD Repeater operating in band III. |
| | 1710 – 1785 MHz | -49 dBm | 1 MHz | This requirement does not apply to the up-link of the UTRA FDD Repeater operating in band III, since it is already covered by the band III requirement in sub-clause 9.2.2. |
| FDD Band IV | 2110 – 2155 MHz | -52 dBm | 1 MHz | This requirement does not apply to UTRA FDD Repeater operating in band IV. |
| | 1710 – 1755 MHz | -49 dBm | 1 MHz | This requirement does not apply to the up-link of the UTRA FDD Repeater operating in band IV, since it is already covered by the band IV requirement in sub-clause 9.2.2. |
| FDD Band V | 869 – 894 MHz | -52 dBm | 1 MHz | This requirement does not apply to UTRA FDD Repeater operating in band V. |

| | | | | |
|---|---|---|---|---|
| | 824 – 849 MHz | -49 dBm | 1 MHz | This requirement does not apply to the up-link of the UTRA FDD Repeater operating in band V, since it is already covered by the band V requirement in sub-clause 9.2.2. |
| FDD Band VI | 860 - 895 MHz | -52 dBm | 1 MHz | This requirement does not apply to UTRA FDD Repeater operating in band VI. |
| | 815 - 850 MHz | -49 dBm | 1 MHz | This requirement does not apply to the up-link of the UTRA FDD Repeater operating in band VI, since it is already covered by the band VI requirement in sub-clause 9.2.2. |

### 9.2.4 Co-existence with co-located and co-sited Base Stations

These requirements may be applied for the protection of other BS receivers when GSM900 and/or DCS1800, PCS1900, GSM850 and/or FDD BS operating in Bands I to VI are co-located with a UTRA FDD Repeater.

### 9.2.4.1 Minimum Requirements

The power of any spurious emission shall not exceed the limits of Table 9.10 for a UTRA FDD Repeater where requirements for co-location with the Base Station listed in the first column apply.

**Table 9.10: UTRA Repeater up-link and down-link spurious emissions limits for Repeater co-located with Base Stations**

| Type of co-located Base Station | Band for co-location requirement | Maximum Level | Measurement Bandwidth | Note |
|---|---|---|---|---|
| GSM900 | 876 - 915 MHz | -98 dBm | 100 kHz | |
| DCS1800 | 1710 - 1785 MHz | -98 dBm | 100 kHz | This requirement does not apply to the up-link of UTRA FDD Repeater operating in band III. The requirement of band III in sub-clause 9.2.2 applies, but requires a 75dB coupling loss between base station and the repeater UL transmit port. |
| PCS1900 | 1850 - 1910 MHz | -98 dBm | 100 kHz | This requirement does not apply to the up-link of UTRA FDD Repeater operating in band Íl. The requirement of band II in sub-clause 9.2.2 applies, but requires a 75dB coupling loss between base station and the repeater UL transmit port. |
| GSM850 | 824 - 849 MHz | -98 dBm | 100 kHz | This requirement does not apply to the up-link of UTRA FDD Repeater operating in band V. The requirement of band V in sub-clause 9.2.2 applies, but requires a 75dB coupling loss between base station and the repeater UL transmit port. |
| UTRA FDD Band I | 1920 - 1980 MHz | -96 dBm | 100 kHz | This requirement does not apply to the up-link of UTRA FDD Repeater operating in band I. The requirement of band I in sub-clause 9.2.2 applies, but requires a 73dB coupling loss between base station and the repeater UL transmit port. |
| UTRA FDD Band II | 1850 - 1910 MHz | -96 dBm | 100 kHz | This requirement does not apply to the up-link of UTRA FDD Repeater operating in band II. The requirement of band II in sub-clause 9.2.2 applies, but requires a 73dB coupling loss between base station and the repeater UL transmit port. |
| UTRA FDD Band III | 1710 - 1785 MHz | -96 dBm | 100 kHz | This requirement does not apply to the up-link of UTRA FDD Repeater operating in band III. The requirement of band III in sub-clause 9.2.2 applies, but requires a 73dB coupling loss between base station and the repeater UL transmit port. |
| UTRA FDD Band IV | 1710 - 1755 MHz | -96 dBm | 100 kHz | This requirement does not apply to the up-link of UTRA FDD Repeater operating in band IV. The requirement of band IV in sub-clause 9.2.2 applies, but requires a 73dB coupling loss between base station and the repeater UL transmit port. |

| | | | | |
|---|---|---|---|---|
| UTRA FDD Band V | 824 - 849 MHz | -96 dBm | 100 kHz | This requirement does not apply to the up-link of UTRA FDD Repeater operating in band V. The requirement of band V in sub-clause 9.2.2 applies, but requires a 73dB coupling loss between base station and the repeater UL transmit port. |
| UTRA FDD Band VI | 815 - 850 MHz | -96 dBm | 100 kHz | This requirement does not apply to the up-link of UTRA FDD Repeater operating in band VI. The requirement of band VI in sub-clause 9.2.2 applies, but requires a 73dB coupling loss between base station and the repeater UL transmit port. |

## 9.2.5 Co-existence with PHS

This requirement may be applied for the protection of PHS in geographic areas in which both PHS and UTRA-FDD Repeaters are deployed. This requirement is also applicable at specified frequencies falling between 12,5 MHz below the centre frequency of the first 5 MHz channel or more than 12,5 MHz above the centre frequency of the last 5 MHz channel in the pass band.

### 9.2.5.1 Minimum Requirement

The power of any spurious emission shall not exceed:

**Table 9.13: UTRA Repeater up-link and down-link spurious emissions limits for in geographic coverage area of PHS**

| Band | Maximum Level | Measurement Bandwidth | Note |
|---|---|---|---|
| 1884,5 - 1919,6 MHz | -41 dBm | 300 kHz | |

## 9.2.6 Co-existence with UTRA-TDD

### 9.2.6.1 Operation in the same geographic area

This requirement may be applied to geographic areas in which both UTRA-TDD and UTRA-FDD Repeaters are deployed.

#### 9.2.6.1.1 Minimum Requirement

In the down-link direction of the Repeater the power of any spurious emission shall not exceed:

**Table 9.14: UTRA Repeater down-link spurious emissions limits in geographic coverage area of UTRA-TDD**

| Band | Maximum Level | Measurement Bandwidth | Note |
|---|---|---|---|
| 1900 - 1920 MHz | -52 dBm | 1 MHz | |
| 2010 - 2025 MHz | -52 dBm | 1 MHz | |

In the up-link direction of the Repeater the power of any spurious emission shall not exceed:

**Table 9.14A: UTRA Repeater up-link spurious emissions limits in geographic coverage area of UTRA-TDD**

| Band | Maximum Level | Measurement Bandwidth | Note |
|---|---|---|---|
| 1900 - 1920 MHz | -53 dBm | 100 kHz | This requirement is applied only to UTRA FDD Repeater operating in band I or II. |
| 1900 - 1920 MHz | -52 dBm | 1 MHz | This requirement does not apply to UTRA FDD Repeater operating in band I or II. |
| 2010 - 2025 MHz | -53 dBm | 100 kHz | |

NOTE 1: The requirements of -53dBm/100kHz in Table 9.14A for the up link direction of the Repeater reflect what can be achieved with present state of the art technology and are based on a coupling loss of 73 dB between a Repeater and a UTRA TDD BS receiver.

NOTE 2: The requirements shall be reconsidered when the state of the art technology progresses.

### 9.2.6.2 Co-located Repeaters and UTRA-TDD base stations

This requirement may be applied for the protection of UTRA-TDD BS receivers when UTRA-TDD BS and UTRA-FDD Repeater are co-located.

#### 9.2.6.2.1 Minimum Requirement

In the down-link direction of the Repeater the power of any spurious emission shall not exceed:

**Table 9.15: UTRA Repeater down-link spurious emissions limits for protection of co-located UTRA TDD BS receiver**

| Band | Maximum Level | Measurement Bandwidth | Note |
|---|---|---|---|
| 1900 - 1920 MHz | -86 dBm | 1 MHz | |
| 2010 - 2025 MHz | -86 dBm | 1 MHz | |

In the up-link direction of the Repeater the power of any spurious emission shall not exceed:

**Table 9.15A: UTRA Repeater up-link spurious emissions limits for protection of co-located UTRA TDD BS receiver**

| Band | Maximum Level | Measurement Bandwidth | Note |
|---|---|---|---|
| 1900 - 1920 MHz | -53 dBm | 100 kHz | This requirement is applied only to UTRA FDD Repeater operating in band I or II. |
| 1900 - 1920 MHz | -86 dBm | 1 MHz | This requirement does not apply to UTRA FDD Repeater operating in band I or II. |
| 2010 - 2025 MHz | -83 dBm | 100 kHz | This requirement is applied only to UTRA FDD Repeater operating in band I. |
| 2010 - 2025 MHz | -86 dBm | 1 MHz | This requirement does not apply to UTRA FDD Repeater operating in band I |

NOTE 1: The requirements of -53dBm/100kHz in Table 9.15A for the up link direction of the Repeater reflect what can be achieved with present state of the art technology and are based on a coupling loss of 73 dB between a Repeater and a UTRA TDD BS receiver.

NOTE 2: The requirements of -83dBm/100kHz in Table 9.15A for the up link direction of the Repeater reflect what can be achieved with present state of the art technology and are based on a coupling loss of 43 dB between a Repeater and a UTRA TDD BS receiver.

NOTE 3: The requirements shall be reconsidered when the state of the art technology progresses.

### 9.2.7 Co-existence with services in adjacent frequency bands

This requirement may be applied for the protection in bands adjacent to bands I, II or III, as defined in clause 5.1 in geographic areas in which both an adjacent band service and UTRA are deployed.

The requirement applies only to the down-link direction of the repeater.

#### 9.2.7.1 Minimum requirement

The power of any spurious emission shall not exceed:

**Table 9.16: UTRA Repeater down-link spurious emissions limits for protection of adjacent band services**

| Operating Band | Band | Maximum Level | Measurement Bandwidth | Note |
|---|---|---|---|---|
| I | 2100-2105 MHz | -30 + 3.4 (f - 2100 MHz) dBm | 1 MHz | |
| | 2175-2180 MHz | -30 + 3.4 (2180 MHz - f) dBm | 1 MHz | |
| II | 1920-1925 MHz | -30 + 3.4 (f - 1920 MHz) dBm | 1 MHz | |
| | 1995-2000 MHz | -30 + 3.4 (2000 MHz - f) dBm | 1 MHz | |
| III | 1795-1800 MHz | -30 + 3.4 (f - 1795 MHz) dBm | 1 MHz | |
| | 1885-1890 MHz | -30 + 3.4 (1890 MHz - f) dBm | 1 MHz | |

# 10 Modulation accuracy

## 10.1 Error Vector Magnitude

The modulation accuracy is defined by the Error Vector Magnitude (EVM), which is a measure of the difference between the theoretical waveform and a modified version of the measured waveform. This difference is called the error vector. The measured waveform is modified by first passing it through a matched root raised cosine filter with bandwidth 3.84 MHz and roll-off $\alpha$=0.22. The waveform is then further modified by selecting the frequency, absolute phase, absolute amplitude and chip clock timing so as to minimise the error vector. The EVM result is defined as root of the ratio of the mean error vector power to the mean reference signal power expressed as a %.

The measurement interval is one power control group (timeslot). The repeater shall operate with an ideal WCDMA signal in the pass band of the repeater at a level, which produce the maximum rated output power per channel, as specified by the manufacturer.

### 10.1.1 Minimum requirement

The Error Vector Magnitude shall not be worse than 12,5 %.

## 10.2 Peak code domain error

The peak code domain error is computed by projecting the power of the error vector (as defined in subclause 10.1) onto the code domain at a specified spreading factor. The code domain error for every code in the domain is defined as the ratio of the mean power of the projection onto that code, to the mean power of the composite reference waveform. This ratio is expressed in dB. The peak code domain error is defined as the maximum value for the code domain error for all codes. The measurement interval is one power control group (timeslot).

### 10.2.1 Minimum requirement

The peak code domain error shall not exceed -35 dB at spreading factor 256.

# 11 Input Intermodulation

The input intermodulation is a measure of the capability of the repeater to inhibit the generation of interference in the pass band, in the presence of interfering signals on frequencies other than the pass band.

## 11.1 General Requirement

The following requirement applies for interfering signals in the frequency bands defined in sub-clause 5.1, depending on the repeaters pass band. The requirement shall bet met with the repeater operating at maximum gain.

### 11.1.1 Minimum requirement

For the parameters specified in table 11.1, the power in the pass band, shall not increase with more than 10 dB at the output of the repeater as measured in the centre of the pass band, compared to the level obtained without interfering signals applied.

The frequency separation between the two interfering signals shall be adjusted so that the 3rd order intermodulation product is positioned in the centre of the pass band.

Table 11.1 specifies the parameters for two interfering signals, where:

- f_offset is the separation between the centre frequency of first or last 5 MHz channel in the pass band and one the interfering signals.

**Table 11.1: Input intermodulation requirement**

| f_offset | Interfering Signal Levels | Type of signals | Measurement bandwidth |
|---|---|---|---|
| 3,5 MHz | -40 dBm | 2 CW carriers | 1 MHz |

## 11.2 Co-location with BS in other systems

The following requirement may be applied when GSM 900 BTS and/or DCS 1800 BTS and UTRA-FDD Repeaters are co-located. The requirement shall bet met with the repeater operating at maximum gain.

### 11.2.1 Minimum requirements - Co-location with GSM900, DCS 1800, PCS1900, GSM850 and/or UTRA FDD

This additional input intermodulation requirement may be applied for the protection of FDD Repeater input when GSM900, DCS1800, PCS1900, GSM850 and/or FDD BS operating in Bands I to VI are co-located with a UTRA FDD Repeater.

For the parameters specified in table 11.2, the power in the pass band shall not increase with more than 10 dB at the output of the repeater as measured in the centre of the pass band, compared to the level obtained without interfering signals applied.

The frequency separation between the two interfering signals shall be adjusted so that the lowest order intermodulation product is positioned in the centre of the pass band.

NOTE 1: The lowest intermodulation products corresponds to the 4th and 3rd order for the GSM 900 and DCS 1800 bands, respectively.

**Table 11.2: Input intermodulation requirements for interfering signals in other bands**

| Co-located other band | Frequency of interfering signals | Interfering Signal Levels | Type of signals | Measurement bandwidth |
|---|---|---|---|---|
| GSM900 | 921 - 960 MHz | +16 dBm | 2 CW carriers | 1 MHz |
| DCS1800 | 1805 - 1880 MHz | +16 dBm | 2 CW carriers | 1 MHz |
| PCS1900 | 1930 – 1990 MHz | +16 dBm | 2 CW carriers | 1 MHz |
| GSM850 | 869 – 894 MHz | +16 dBm | 2 CW carriers | 1 MHz |
| UTRA-FDD Band I | 2110 – 2170 MHz | +16 dBm | 2 CW carriers | 1 MHz |
| UTRA-FDD Band II | 1930 – 1990 MHz | +16 dBm | 2 CW carriers | 1 MHz |
| UTRA-FDD Band III | 1805 – 1880 MHz | +16 dBm | 2 CW carriers | 1 MHz |
| UTRA-FDD Band IV | 2110 – 2155 MHz | +16 dBm | 2 CW carriers | 1 MHz |
| UTRA-FDD Band V | 869 – 894 MHz | +16 dBm | 2 CW carriers | 1 MHz |
| UTRA-FDD Band VI | 875 – 885 MHz | +16 dBm | 2 CW carriers | 1 MHz |

### 11.2.2 Minimum Requirement - Co-location with UTRA-TDD

The current state-of-the-art technology does not allow a single generic solution for co-location with UTRA-TDD on adjacent frequencies for 30dB BS-Repeater minimum coupling loss.

However, there are certain site-engineering solutions that can be used. These techniques are addressed in TR 25.942 [5].

## 11.3 Co-existence with other systems

The following requirement may be applied when GSM 900, DCS 1800, PCS1900, GSM850 and/or UTRA FDD BS operating in another frequency band and UTRA-FDD Repeaters co-exist. The requirement shall bet met with the repeater operating at maximum gain.

### 11.3.1 Minimum requirements

For the parameters specified in table 11.3, the power in the pass band shall not increase with more than 10 dB at the output of the repeater as measured in the centre of the pass band, compared to the level obtained without interfering signals applied.

The frequency separation between the two interfering signals shall be adjusted so that the lowest order intermodulation product is positioned in the centre of the pass band.

NOTE 1: The lowest intermodulation products corresponds to the $4^{th}$ and $3^{rd}$ order for the GSM 900 and DCS 1800 bands, respectively.

**Table 11.3: Input intermodulation requirements for interfering signals in other bands**

| Co-existenc with other band | Frequency of interfering signals | Interfering Signal Levels | Type of signals | Measurement bandwidth |
|---|---|---|---|---|
| GSM900 | 876 - 915 MHz | –15 dBm | 2 CW carriers | 1 MHz |
| DCS1800 | 1710 - 1785 MHz | –15 dBm | 2 CW carriers | 1 MHz |
| PCS1900 | 1850 - 1910 MHz | -15 dBm | 2 CW carriers | 1 MHz |
| GSM850 | 824 - 849 MHz | -15 dBm | 2 CW carriers | 1 MHz |
| UTRA-FDD Band I | 1920 – 1980 MHz | -15 dBm | 2 CW carriers | 1 MHz |
| UTRA-FDD Band II | 1850 – 1910 MHz | -15 dBm | 2 CW carriers | 1 MHz |
| UTRA-FDD Band III | 1710 – 1785 MHz | -15 dBm | 2 CW carriers | 1 MHz |
| UTRA-FDD Band IV | 1710 – 1755 MHz | -15 dBm | 2 CW carriers | 1 MHz |
| UTRA-FDD Band V | 824 – 849 MHz | -15 dBm | 2 CW carriers | 1 MHz |
| UTRA-FDD Band VI | 830 – 840 MHz | -15 dBm | 2 CW carriers | 1 MHz |

# 12 Output intermodulation

The output intermodulation requirement is a measure of the ability of the repeater to inhibit the generation of intermodulation products signals created by the presence of an interfering signal reaching the repeater via the output port.

The output intermodulation level is the power of the intermodulation products when a WCDMA modulated interference signal is injected into the output port at a level of 30 dB lower than that of the wanted signal. The frequency of the interference signal shall be ±5 MHz, ±10 MHz and ±15 MHz offset from the wanted signal, but within the frequency band allocated for UTRA FDD downlink as specified in subclause 4.1.

The requirement is applicable for downlink signals.

## 12.1 Minimum requirement

The output intermodulation level shall not exceed the out of band emission or the spurious emission requirements of section 9.1 and 9.2.

# 13 Adjacent Channel Rejection Ratio (ACRR)

## 13.1 Definitions and applicability

Adjacent Channel Rejection Ratio (ACRR) is the ratio of the RRC weighted gain per carrier of the repeater in the pass band to the RRC weighted gain of the repeater on an adjacent channel.

The requirement shall apply to the Uplink and Downlink of Repeater where the donor link is maintained via antennas (over the air Repeater).

## 13.2 Minimum Requirements

In normal conditions the ACRR shall be higher than the value specified in the Table 13.1.

**Table 13.1: Repeater ACRR**

| Repeater maximum output power as in 9.1.1 | Channel offset from the centre frequency of the first or last 5 MHz channel within the pass band. | ACRR limit |
|---|---|---|
| P ≥ 31 dBm | 5 MHz | 33dB |
| P ≥ 31 dBm | 10 MHz | 33dB |
| P < 31 dBm | 5 MHz | 20dB |
| P < 31 dBm | 10 MHz | 20dB |

# Annex A (informative): Change History

**Table A.1: Change History**

| TSG | Doc | CR | R | Title | Cat | Curr | New | WI |
|---|---|---|---|---|---|---|---|---|
| RP-22 | | | | Rel-6 version created from v5.7.0 to be sent to ITU-R for Rev 4 of M.1457 | | | 6.0.0 | |
| RP-24 | RP-040191 | 0032 | | Spurious emissions: Co-existence with services in adjacent frequency bands | A | 6.0.0 | 6.1.0 | RInImp-Rep |
| RP-24 | RP-040192 | 0035 | 1 | New Adjacent Channel Rejection Ratio for Repeaters | A | 6.0.0 | 6.1.0 | RInImp-Rep |
| RP-25 | RP-040289 | 0036 | | Spurious emissions: Redrafting of tables for co-existence | F | 6.1.0 | 6.2.0 | RInImp-REP |
| RP-30 | RP-050730 | 0039 | | Clarification of "12.5MHz rule" and modification of spurious emissions for protection of PHS | A | 6.2.0 | 6.3.0 | TEI4 |
| RP-31 | RP-060100 | 0041 | | Introduction of operating band III to VI requirements in 25.106 | B | 6.3.0 | 6.4.0 | TEI6 |
| RP-33 | RP-060520 | 0045 | 1 | Clean up of Spurious emissions | F | 6.4.0 | 6.5.0 | TEI5 |
| RP-33 | RP-060521 | 0048 | 1 | New UTRA Repeater up-link spurious emissions limits for co-existence/co-location with TDD | F | 6.4.0 | 6.5.0 | TEI5 |

# History

| Document history | | |
|---|---|---|
| V6.0.0 | December 2003 | Publication |
| V6.1.0 | June 2004 | Publication |
| V6.2.0 | September 2004 | Publication |
| V6.3.0 | December 2005 | Publication |
| V6.4.0 | March 2006 | Publication |
| V6.5.0 | October 2006 | Publication |