

# ETSI TS 125 106 V11.0.0 (2012-10)



## **Universal Mobile Telecommunications System (UMTS); UTRA repeater radio transmission and reception (3GPP TS 25.106 version 11.0.0 Release 11)**



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## Foreword

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# Foreword

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# 1 Scope

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

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## 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.
- For a specific reference, subsequent revisions do not apply.
- 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".
- [6] 3GPP TS 25.104: "UTRA(BS) FDD; Radio transmission and Reception".

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## 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.

**Operating band:** the frequency range in which UTRA FDD operates, that is defined with a specific set of technical requirements.

NOTE 1: The operating band(s) for an UTRA Repeater is declared by the manufacturer according to the designations in clause 5.1, Table 5.1.

NOTE 2: Unless specified, operating band refers to the uplink operating band and downlink operating band.

**Pass band:** The frequency range in which 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. A repeater can have one or several pass bands.

**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:

BS	Base Transceiver Station
DL	Down Link (forward link)
DTT	Digital Terrestrial Television
EVM	Error Vector Magnitude
FDD	Frequency Division Duplex
FFS	For Further Study
IMT2000	International Mobile Telecommunication-2000
ITU	International Telecommunication Union
RCDE	Relative Code Domain Error.
RF	Radio Frequency
UARFCN	UTRA Absolute Radio Frequency Channel Number
UL	Up Link (reverse link)
UMTS	Universal Mobile Telecommunication System
UTRA	Universal Terrestrial Radio Access
WCDMA	Wide band Code Division Multiple Access

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## 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	TX – RX 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.
9.1.2	Operating band unwanted emissions	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.
9.2.3	Spurious emissions: 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	Spurious emissions: 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 and/or E-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 and/or E-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.
9.2.8	Spurious emissions: Protection of public safety operations	This requirement may be applied for the protection of public safety systems in geographic areas in which both UTRA FDD Repeater and public safety systems are deployed.
11.2	Input Intermodulation: Co-location with BS in 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**

<b>Operating Band</b>	<b>UL Frequencies UE transmit, Node B receive</b>	<b>DL frequencies UE receive, Node B transmit</b>
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
VII	2500 - 2570 MHz	2620 - 2690 MHz
VIII	880 - 915 MHz	925 - 960 MHz
IX	1749.9 - 1784.9 MHz	1844.9 - 1879.9 MHz
X	1710 - 1770 MHz	2110 - 2170 MHz
XI	1427.9 - 1447.9 MHz	1475.9 - 1495.9 MHz
XII	698 - 716 MHz	728 - 746 MHz
XIII	777 - 787 MHz	746 - 756 MHz
XIV	788 - 798 MHz	758 - 768 MHz
XV	Reserved	Reserved
XVI	Reserved	Reserved
XVII	Reserved	Reserved
XVII	Reserved	Reserved
XIX	830 – 845 MHz	875 – 890 MHz
XX	832 – 862 MHz	791 – 821 MHz
XXI	1447.9 – 1462.9 MHz	1495.9 – 1510.9 MHz
XXII	3410 – 3490 MHz	3510 – 3590 MHz
XXV	1850 – 1915 MHz	1930 – 1995 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**

<b>Operating Band</b>	<b>TX-RX frequency separation</b>
I	190 MHz
II	80 MHz.
III	95 MHz
IV	400 MHz
V	45 MHz
VI	45 MHz
VII	120 MHz
VIII	45 MHz
IX	95 MHz
X	400 MHz
XI	48 MHz
XII	30 MHz
XIII	31 MHz
XIV	30 MHz
XIX	45 MHz
XX	41 MHz
XXI	48 MHz
XXII	100 MHz
XXV	80 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  $F_{UL\_low} \leq F_{UL} \leq F_{UL\_high}$

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

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
VII	2100	2502.4	2567.6	2175	2622.4	2687.6
VIII	340	882.4	912.6	340	927.4	957.6
IX	0	1752.4	1782.4	0	1847.4	1877.4
X	1135	1712.4	1767.6	1490	2112.4	2167.6
XI	733	1430.4	1450.4	736	1478.4	1498.4
XII	-22	700.4	713.6	-37	730.4	743.6
XIII	21	779.4	784.6	-55	748.4	753.6
XIV	12	790.4	795.6	-63	760.4	765.6
XIX	770	832.4	842.6	735	877.4	887.6
XX	-23	834.4	859.6	-109	793.4	818.6
XXI	1358	1450.4	1460.4	1326	1498.4	1508.4
XXII	2525	3412.4	3487.6	2580	3512.4	3587.6
XXV	875	1852.4	1912.6	910	1932.4	1992.6

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
VII	2030.1	2502.5, 2507.5, 2512.5, 2517.5, 2522.5, 2527.5, 2532.5, 2537.5, 2542.5, 2547.5, 2552.5, 2557.5, 2562.5, 2567.5	2105.1	2622.5, 2627.5, 2632.5, 2637.5, 2642.5, 2647.5, 2652.5, 2657.5, 2662.5, 2667.5, 2672.5, 2677.5, 2682.5, 2687.5
VIII	-	-	-	-
IX	-	-	-	-
X	1075.1	1712.5, 1717.5, 1722.5, 1727.5, 1732.5, 1737.5, 1742.5, 1747.5, 1752.5, 1757.5, 1762.5, 1767.5	1430.1	2112.5, 2117.5, 2122.5, 2127.5, 2132.5, 2137.5, 2142.5, 2147.5, 2152.5, 2157.5, 2162.5, 2167.5
XI	-	-	-	-
XII	-39.9	700.5, 701.5, 706.5, 707.5, 712.5, 713.5	-54.9	730.5, 731.5, 736.5, 737.5, 742.5, 743.5
XIII	11.1	779.5, 784.5	-64.9	748.5, 753.5
XIV	2.1	790.5, 795.5	-72.9	760.5, 765.5
XIX	755.1	832.5, 837.5, 842.5	720.1	877.5, 882.5, 887.5
XX	-	-	-	-
XXI	-	-	-	-
XXII	-	-	-	-
XXV	810.1	1852.5, 1857.5, 1862.5, 1867.5, 1872.5, 1877.5, 1882.5, 1887.5, 1892.5, 1897.5, 1902.5, 1907.5, 1912.5	845.1	1932.5, 1937.5, 1942.5, 1947.5, 1952.5, 1957.5, 1962.5, 1967.5, 1972.5, 1977.5, 1982.5, 1987.5, 1992.5

## 6 Output power

Output power,  $P_{out}$ , 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,  $P_{max}$ , 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
$P \geq 43$ dBm	+2 dB and -2 dB
$39 \leq P < 43$ dBm	+2 dB and -2 dB
$31 \leq P < 39$ 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
$P \geq 43$ dBm	+2,5 dB and -2,5 dB
$39 \leq P < 43$ dBm	+2,5 dB and -2,5 dB
$31 \leq P < 39$ 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  $\pm 0,01$  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:

- $f_{\text{offset}}$  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, $f_{\text{offset}}$	Maximum gain
$2,7 \leq f_{\text{offset}} < 3,5$ MHz	60 dB
$3,5 \leq f_{\text{offset}} < 7,5$ MHz	45 dB
$7,5 \leq f_{\text{offset}} < 12,5$ MHz	45 dB
$12,5 \text{ MHz} \leq f_{\text{offset}}$	35 dB

For  $12,5 \text{ MHz} \leq f_{\text{offset}}$  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 $\leq$ minimum donor coupling loss
$31 \text{ dBm} \leq P < 43$ dBm	Out of band gain $\leq$ minimum donor coupling loss
$P \geq 43$ dBm	Out of band gain $\leq$ minimum donor coupling loss - (P-43dBm)

NOTE 1: The out of band gain is considered with  $12,5 \text{ MHz} \leq f_{\text{offset}}$

## 9 Unwanted emission

Unwanted emissions consist of out-of-band emissions and spurious emissions [1]. Out of band emissions are unwanted emissions immediately outside the pass band bandwidth resulting from the modulation process and non-linearity in the transmitter, but excluding 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.

The out-of-band emissions requirement for repeater is specified both in terms operating band unwanted emissions and protection of the BS receiver in the operating band. The Operating band unwanted emissions define all unwanted emissions in the repeater operating band plus the frequency ranges 10 MHz above and 10 MHz below that band. Unwanted emissions outside of this frequency range are limited by a spurious emissions requirement.

### 9.1 Out of band emission

#### 9.1.1 Void

#### 9.1.2 Operating band unwanted emissions

Operating band unwanted emissions comprise an emission mask applied outside the repeater passband and a general requirement applied outside the mask but inside the frequency range of the operating band unwanted emissions.

The general operating band unwanted emissions limits are given in table 9.0

**Table 9.0: General operating band unwanted emissions requirements**

Frequency range of operating band	Category A	Category B	Measurement bandwidth	Notes
$\leq 1$ GHz	-13 dBm	-16 dBm	100 kHz	1,2
$\geq 1$ GHz	-13 dBm	-15 dBm	1 MHz	2,3

NOTE 1: Bandwidth as in ITU-R Recommendation SM.329 [1], s4.1

NOTE 2: Limit based on ITU-R Recommendation SM.329 [1], s4.3 and Annex 7

NOTE 3: Bandwidth as in ITU-R Recommendation SM.329 [1], s4.1. Upper frequency as in ITU-R SM.329 [1], s2.5 table 1

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 12,5 MHz.
- $\Delta f_{max}$  is equal to  $f_{offset_{max}}$  minus half of the bandwidth of the measurement filter.

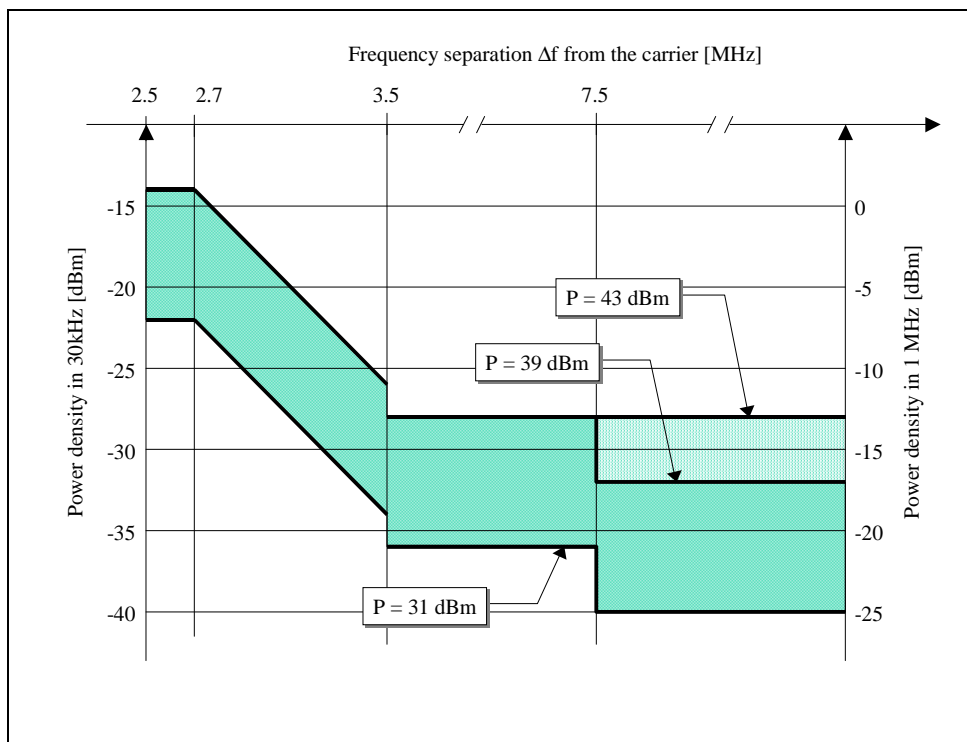


Figure 9.1: Illustrative diagram of emission mask

Table 9.1: Emission mask values, maximum output power  $P \geq 43$  dBm

Frequency offset of measurement filter -3dB point, $\Delta f$	Frequency offset of measurement filter centre frequency, $f_{offset}$	Minimum requirement	Measurement bandwidth (Note 2)
$2,5 \text{ MHz} \leq \Delta f < 2,7 \text{ MHz}$	$2,515\text{MHz} \leq f_{offset} < 2,715\text{MHz}$	-14 dBm	30 kHz
$2,7 \text{ MHz} \leq \Delta f < 3,5 \text{ MHz}$	$2,715\text{MHz} \leq f_{offset} < 3,515\text{MHz}$	$-14\text{dBm} - 15 \cdot \left( \frac{f_{offset}}{\text{MHz}} - 2,715 \right) \text{ dB}$	30 kHz
(Note 1)	$3,515\text{MHz} \leq f_{offset} < 4,0\text{MHz}$	-26 dBm	30 kHz
$3,5 \text{ MHz} \leq \Delta f \leq f_{max}$	$4,0\text{MHz} \leq f_{offset} < f_{offset_{max}}$	-13 dBm	1 MHz

**Table 9.2: Emission mask values, maximum output power  $39 \leq P < 43$  dBm**

Frequency offset of measurement filter -3dB point, $\Delta f$	Frequency offset of measurement filter centre frequency, $f_{\text{offset}}$	Minimum requirement	Measurement bandwidth (Note 2)
$2,5 \text{ MHz} \leq \Delta f < 2,7 \text{ MHz}$	$2,515\text{MHz} \leq f_{\text{offset}} < 2,715\text{MHz}$	-14 dBm	30 kHz
$2,7 \text{ MHz} \leq \Delta f < 3,5 \text{ MHz}$	$2,715\text{MHz} \leq f_{\text{offset}} < 3,515\text{MHz}$	$-14\text{dBm} - 15 \cdot \left( \frac{f_{\text{offset}}}{\text{MHz}} - 2,715 \right) \text{dB}$	30 kHz
(Note 1)	$3,515\text{MHz} \leq f_{\text{offset}} < 4,0\text{MHz}$	-26 dBm	30 kHz
$3,5 \text{ MHz} \leq \Delta f < 7,5 \text{ MHz}$	$4,0\text{MHz} \leq f_{\text{offset}} < 8,0\text{MHz}$	-13 dBm	1 MHz
$7,5 \text{ MHz} \leq \Delta f \leq f_{\text{max}}$	$8,0\text{MHz} \leq f_{\text{offset}} < f_{\text{offset}_{\text{max}}}$	$P - 56 \text{ dB}$	1 MHz

**Table 9.3: Emission mask values, maximum output power  $31 \leq P < 39$  dBm**

Frequency offset of measurement filter -3dB point, $\Delta f$	Frequency offset of measurement filter centre frequency, $f_{\text{offset}}$	Minimum requirement	Measurement bandwidth (Note 2)
$2,5 \text{ MHz} \leq \Delta f < 2,7 \text{ MHz}$	$2,515\text{MHz} \leq f_{\text{offset}} < 2,715\text{MHz}$	$P - 53 \text{ dB}$	30 kHz
$2,7 \text{ MHz} \leq \Delta f < 3,5 \text{ MHz}$	$2,715\text{MHz} \leq f_{\text{offset}} < 3,515\text{MHz}$	$P - 53\text{dB} - 15 \cdot \left( \frac{f_{\text{offset}}}{\text{MHz}} - 2,715 \right) \text{dB}$	30 kHz
(Note 1)	$3,515\text{MHz} \leq f_{\text{offset}} < 4,0\text{MHz}$	$P - 65 \text{ dB}$	30 kHz
$3,5 \text{ MHz} \leq \Delta f < 7,5 \text{ MHz}$	$4,0\text{MHz} \leq f_{\text{offset}} < 8,0\text{MHz}$	$P - 52 \text{ dB}$	1 MHz
$7,5 \text{ MHz} \leq \Delta f \leq f_{\text{max}}$	$8,0\text{MHz} \leq f_{\text{offset}} < f_{\text{offset}_{\text{max}}}$	$P - 56 \text{ dB}$	1 MHz

**Table 9.4: Emission mask values, maximum output power  $P < 31$  dBm**

Frequency offset of measurement filter -3dB point, $\Delta f$	Frequency offset of measurement filter centre frequency, $f_{\text{offset}}$	Minimum requirement	Measurement bandwidth (Note 2)
$2,5 \text{ MHz} \leq \Delta f < 2,7 \text{ MHz}$	$2,515\text{MHz} \leq f_{\text{offset}} < 2,715\text{MHz}$	-22 dBm	30 kHz
$2,7 \text{ MHz} \leq \Delta f < 3,5 \text{ MHz}$	$2,715\text{MHz} \leq f_{\text{offset}} < 3,515\text{MHz}$	$-22\text{dBm} - 15 \cdot \left( \frac{f_{\text{offset}}}{\text{MHz}} - 2,715 \right) \text{dB}$	30 kHz
(Note 1)	$3,515\text{MHz} \leq f_{\text{offset}} < 4,0\text{MHz}$	-34 dBm	30 kHz
$3,5 \text{ MHz} \leq \Delta f < 7,5 \text{ MHz}$	$4,0\text{MHz} \leq f_{\text{offset}} < 8,0\text{MHz}$	-21 dBm	1 MHz
$7,5 \text{ MHz} \leq \Delta f \leq f_{\text{max}}$	$8,0\text{MHz} \leq f_{\text{offset}} < f_{\text{offset}_{\text{max}}}$	-25 dBm	1 MHz

For operation in band II, IV, V, X, XII, XIII, XIV and XXV, the applicable additional requirement in Tables 9.4A, 9.4B or 9.4C apply in addition to the minimum requirements in Tables 9.1 to 9.4.



**Table 9.4A: Additional emission mask values for Bands II, IV, X, XXV**

Frequency offset of measurement filter -3dB point, $\Delta f$	Frequency offset of measurement filter centre frequency, $f_{\text{offset}}$	Additional requirement	Measurement bandwidth (Note 2)
$2.5 \text{ MHz} \leq \Delta f < 3.5 \text{ MHz}$	$2.515\text{MHz} \leq f_{\text{offset}} < 3.515\text{MHz}$	-15 dBm	30 kHz
$3.5 \text{ MHz} \leq \Delta f \leq \Delta f_{\text{max}}$	$4.0\text{MHz} \leq f_{\text{offset}} < f_{\text{offset}_{\text{max}}}$	-13 dBm	1 MHz

**Table 9.4B: Additional emission mask values for Band V**

Frequency offset of measurement filter -3dB point, $\Delta f$	Frequency offset of measurement filter centre frequency, $f_{\text{offset}}$	Additional requirement	Measurement bandwidth (Note 2)
$2.5 \text{ MHz} \leq \Delta f < 3.5 \text{ MHz}$	$2.515\text{MHz} \leq f_{\text{offset}} < 3.515\text{MHz}$	-15 dBm	30 kHz
$3.5 \text{ MHz} \leq \Delta f \leq \Delta f_{\text{max}}$	$3.55\text{MHz} \leq f_{\text{offset}} < f_{\text{offset}_{\text{max}}}$	-13 dBm	100 kHz

**Table 9.4C: Additional emission mask values for Bands XII, XIII, XIV**

Frequency offset of measurement filter -3dB point, $\Delta f$	Frequency offset of measurement filter centre frequency, $f_{\text{offset}}$	Additional requirement	Measurement bandwidth (Note 2)
$2.5 \text{ MHz} \leq \Delta f < 2.6 \text{ MHz}$	$2.515\text{MHz} \leq f_{\text{offset}} < 2.615\text{MHz}$	-13 dBm	30 kHz
$2.6 \text{ MHz} \leq \Delta f \leq \Delta f_{\text{max}}$	$2.65\text{MHz} \leq f_{\text{offset}} < f_{\text{offset}_{\text{max}}}$	-13 dBm	100 kHz

In certain regions the following requirement may apply for protection of DTT. For UTRA Repeater operating in Band XX, the level of emissions in the band 470-790 MHz, measured in an 8MHz filter bandwidth on centre frequencies  $F_{\text{filter}}$  according to Table 9.4.D, shall not exceed the maximum emission level  $P_{\text{EM},N}$  declared by the manufacturer.

**Table 9.4.D: Declared emissions levels for protection of DTT**

Filter centre frequency, $F_{\text{filter}}$	Measurement bandwidth	Declared emission level [dBm]
$F_{\text{filter}} = 8 \cdot N + 306 \text{ (MHz)}$ ; $21 \leq N \leq 60$	8 MHz	$P_{\text{EM},N}$

NOTE: The regional requirement is defined in terms of EIRP (effective isotropic radiated power), which is dependent on both the repeater emissions at the antenna connector and the deployment (including antenna gain and feeder loss). The requirement defined above provides the characteristics of the repeater needed to verify compliance with the regional requirement. Compliance with the regional requirement can be determined using the method outlined in TS 25.104 [6] Annex D.

Note for Tables 9.1, 9.2, 9.3, 9.4, 9.4A, 9.4B and 9.4C:

NOTE 1: This frequency range ensures that the range of values of  $f_{\text{offset}}$  is continuous.

### 9.1.3. Protection of the BS receiver in the operating band

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

The requirement applies outside the emission mask.

### 9.1.3.1 Minimum Requirement

This requirement applies to the uplink of the repeater, at maximum gain.

The power of any operating band unwanted emission shall not exceed the limits in Table 9.7A.

**Table 9.7A: Uplink operating band unwanted emissions limits for protection of the BS receiver**

Maximum Level	Measurement Bandwidth	Note
-53 dBm	100 kHz	

NOTE 1: These requirements in Table 9.7A: for the uplink 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.

NOTE 3: The protection of R-GSM is for further study.

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

This requirement may be applied for the protection in bands adjacent to bands I, or VII, 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.

### 9.1.4.1 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	$-30 + 3.4 (f - 2100 \text{ MHz}) \text{ dBm}$	1 MHz	
	2175-2180 MHz	$-30 + 3.4 (2180 \text{ MHz} - f) \text{ dBm}$	1 MHz	
VII	2610-2615 MHz	$-30 + 3.4 (f - 2610 \text{ MHz}) \text{ dBm}$	1 MHz	
	2695-2700 MHz	$-30 + 3.4 (2700 \text{ MHz} - f) \text{ dBm}$	1 MHz	

## 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.

The spurious emission limits apply from 9 kHz to 12.75 GHz (or above, as indicated in Table 9.5 and 9.5A), excluding the frequency range from 10 MHz below the lowest frequency of the repeaters operating band up to 10 MHz above the highest frequency of the repeaters operating band. Exceptions are the requirement in Table 9.13 and 9.16 that apply also closer than 10 MHz from repeaters operating 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	Note 1
150kHz - 30MHz		10 kHz	Note 1
30MHz - 1GHz		100 kHz	Note 1
1GHz - 12,75 GHz		1 MHz	Note 2
12,75GHz – 5 <sup>th</sup> harmonic of the upper frequency edge of the DL or UL operating band for DL or UL spurious emissions, respectively		1 MHz	Note 2, Note 3
NOTE 1: Bandwidth as in ITU-R SM.329 [1], s4.1			
NOTE 2: Upper frequency as in ITU-R SM.329 [1], s2.5 table 1			
NOTE 3: Applies only for Band XXII			

### 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 table 9.5A 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 9.5A: General spurious emissions limits (Category B)**

Band	Maximum Level	Measurement Bandwidth	Note
9 kHz ↔ 150 kHz	-36 dBm	1 kHz	Note 1
150 kHz ↔ 30 MHz	-36 dBm	10 kHz	Note 1
30 MHz ↔ 1 GHz	-36 dBm	100 kHz	Note 1
1 GHz ↔ 12.75 GHz	-30 dBm	1 MHz	Note 2
12.75 GHz ↔ 5 <sup>th</sup> harmonic of the upper frequency edge of the DL or UL operating band for DL or UL spurious emissions, respectively	-30 dBm	1 MHz	Note 2, Note 3
NOTE 1: Bandwidth as in ITU-R Recommendation SM.329 [1], s4.1			
NOTE 2: Bandwidth as in ITU-R Recommendation SM.329 [1], s4.1. Upper frequency as in ITU-R SM.329 [1], s2.5 table 1			
NOTE 3: Applies only for Band XXII			

**Table 9.6: (Void)**

**Table 9.6A: (Void)**

**Table 9.6B: (Void)**

**Table 9.6C: (Void)**

**Table 9.6D: (Void)**

**Table 9.6E: (Void)**

**Table 9.6F: (Void)**

## 9.2.2 Void

## 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 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, E-UTRA FDD and/or UTRA FDD.

### 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	This requirement does not apply to UTRA FDD Repeater operating in band VIII
	876 - 915 MHz	-61 dBm	100 kHz	This requirement does not apply to the UL of the UTRA FDD Repeater operating in band VIII, since it is already covered by the requirement in sub-clause 9.1.3
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 UL of the UTRA FDD Repeater operating in band III, since it is already covered by the requirement in sub-clause 9.1.3.
PCS1900	1930 - 1990 MHz	-47 dBm	100 kHz	This requirement does not apply to UTRA FDD Repeater operating in frequency band II or band XXV.
	1850 - 1910 MHz	-61 dBm	100 kHz	This requirement does not apply to the UL of the UTRA FDD Repeater operating in frequency band II or band XXV, since it is already covered by the requirement in sub-clause 9.1.3.
GSM850 or CDMA850	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 UL of the UTRA FDD Repeater operating in frequency band V, since it is already covered by the requirement in sub-clause 9.1.3.
UTRA FDD Band I or E-UTRA Band 1	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 UL of the UTRA FDD Repeater operating in band I, since it is already covered by the requirement in sub-clause 9.1.3.
UTRA FDD Band II or E-UTRA Band 2	1930 - 1990 MHz	-52 dBm	1 MHz	This requirement does not apply to UTRA FDD Repeater operating in band II or band XXV.
	1850 - 1910 MHz	-49 dBm	1 MHz	This requirement does not apply to the UL of the UTRA FDD Repeater operating in band II or band XXV, since it is already covered by the requirement in sub-clause 9.1.3.
UTRA FDD Band III or E-UTRA Band 3	1805 - 1880 MHz	-52 dBm	1 MHz	This requirement does not apply to UTRA FDD Repeater operating in band III or band IX.
	1710 - 1785 MHz	-49 dBm	1 MHz	This requirement does not apply to the UL of the UTRA FDD Repeater operating in band III or band IX, since it is already covered by the requirement in sub-clause 9.1.3.
UTRA FDD Band IV or E-UTRA Band 4	2110 - 2155 MHz	-52 dBm	1 MHz	This requirement does not apply to UTRA FDD Repeater operating in band IV or band X.
	1710 - 1755 MHz	-49 dBm	1 MHz	This requirement does not apply to the UL of the UTRA FDD Repeater operating in band IV or band X, since it is already covered by the requirement in sub-clause 9.1.3.
UTRA FDD Band V or E-UTRA Band 5	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 UL of the UTRA FDD Repeater operating in band V, since it is already covered by the requirement in sub-clause 9.1.3.
UTRA FDD Band VI or	860 - 895 MHz	-52 dBm	1 MHz	This requirement does not apply to UTRA FDD Repeater operating in band V, VI, XVIII, XIX or XX.

XIX or E-UTRA Band 6, 18 or 19	815 - 830 MHz	-49 dBm	1 MHz	This requirement does not apply to the UL of the UTRA FDD Repeater operating in band V, XVIII or XX, since it is already covered by the requirement in sub-clause 9.1.3.
	830 – 850 MHz	-49 dBm	1 MHz	This requirement does not apply to the UL of UTRA FDD Repeater operating in band V, VI, XIX or XX, since it is already covered by the requirement in sub-clause 9.1.3.
UTRA FDD Band VII or E-UTRA Band 7	2620 - 2690 MHz	-52 dBm	1 MHz	This requirement does not apply to UTRA FDD Repeater operating in band VII.
	2500 - 2570 MHz	-49 dBm	1 MHz	This requirement does not apply to the UL of the UTRA FDD Repeater operating in band VII, since it is already covered by the requirement in sub-clause 9.1.3.
UTRA FDD Band VIII or E-UTRA Band 8	925 - 960 MHz	-52 dBm	1 MHz	This requirement does not apply to UTRA FDD Repeater operating in band VIII.
	880 - 915 MHz	-49 dBm	1 MHz	This requirement does not apply to the UL of the UTRA FDD Repeater operating in band VIII, since it is already covered by the requirement in sub-clause 9.1.3.
UTRA FDD Band IX or E-UTRA Band 9	1844.9 - 1879.9 MHz	-52 dBm	1 MHz	This requirement does not apply to UTRA FDD Repeater operating in band III or band IX.
	1749.9 - 1784.9 MHz	-49 dBm	1 MHz	This requirement does not apply to the UL of the UTRA FDD Repeater operating in band III or band IX, since it is already covered by the requirement in sub-clause 9.1.3.
UTRA FDD Band X or E-UTRA Band 10	2110 - 2170 MHz	-52 dBm	1 MHz	This requirement does not apply to UTRA FDD Repeater operating in band IV or band X.
	1710 - 1770 MHz	-49 dBm	1 MHz	This requirement does not apply to the UL of the UTRA FDD Repeater operating in band IV or band X, since it is already covered by the requirement in sub-clause 9.1.3.
UTRA FDD Band XI or XXI or E-UTRA Band 11 or 21	1475.9 - 1510.9 MHz	-52 dBm	1 MHz	This requirement does not apply to UTRA FDD Repeater operating in band XI or band XXI.
	1427.9 - 1447.9 MHz	-49 dBm	1 MHz	This requirement does not apply to the UL of the UTRA FDD Repeater operating in band XI, since it is already covered by the requirement in sub-clause 9.1.3.
	1447.9 - 1462.9 MHz	-49 dBm	1 MHz	This requirement does not apply to the UL of the UTRA FDD Repeater operating in band XXI, since it is already covered by the requirement in sub-clause 9.1.3.
UTRA FDD Band XII or E-UTRA Band 12	728 - 746 MHz	-52 dBm	1 MHz	This requirement does not apply to UTRA FDD Repeater operating in band XII.
	698 - 716 MHz	-49 dBm	1 MHz	This requirement does not apply to the UL of the UTRA FDD Repeater operating in band XII, since it is already covered by the requirement in sub-clause 9.1.3.
UTRA FDD Band XIII or E-UTRA Band 13	746 - 756 MHz	-52 dBm	1 MHz	This requirement does not apply to UTRA FDD Repeater operating in band XIII.
	777 - 787 MHz	-49 dBm	1 MHz	This requirement does not apply to the UL of the UTRA FDD Repeater operating in band XIII, since it is already covered by the requirement in sub-clause 9.1.3.
UTRA FDD Band XIV or E-UTRA Band 14	758 - 768 MHz	-52 dBm	1 MHz	This requirement does not apply to UTRA FDD Repeater operating in band XIV.
	788 - 798 MHz	-49 dBm	1 MHz	This requirement does not apply to the UL of the UTRA FDD Repeater operating in band XIV, since it is already covered by the requirement in sub-clause 9.1.3.
E-UTRA Band 17	734 - 746 MHz	-52 dBm	1 MHz	This requirement does not apply to UTRA FDD Repeater operating in band XII.
	704 - 716 MHz	-49 dBm	1 MHz	This requirement does not apply to the UL of the UTRA FDD Repeater operating in band XII, since it is already covered by the requirement in sub-clause 9.1.3.
UTRA FDD Band XX or E-UTRA Band 20	791 - 821 MHz	-52 dBm	1 MHz	This requirement does not apply to UTRA FDD Repeater operating in band XX.
	832 - 862 MHz	-49 dBm	1 MHz	This requirement does not apply to the UL of the UTRA FDD Repeater operating in band XIII, since it is already covered by the band XX requirement in sub-clause 9.1.3.
UTRA FDD Band XXII or E-UTRA Band 22	3510 - 3590 MHz	-52 dBm	1 MHz	This requirement does not apply to UTRA FDD repeater operating in band XXII.
	3410 - 3490 MHz	-49 dBm	1 MHz	This requirement does not apply to the uplink of the UTRA FDD repeater operating in band XXII, since it is already covered by the requirement in sub-clause 9.1.3.
E-UTRA Band 23	2180 - 2200 MHz	-52 dBm	1 MHz	

	2000 - 2020 MHz	-49 dBm	1 MHz	This requirement does not apply to UTRA FDD Repeater operating in band II or band XXV, where the limits are defined separately.
	2000 – 2010 MHz	-30 dBm	1 MHz	This requirement only applies to UTRA FDD Repeater operating in band II or band XXV. This requirement applies starting 5 MHz above the band XXV DL operating band.
	2010 – 2020 MHz	-49 dBm	1 MHz	
E-UTRA Band 24	1525 – 1559 MHz	-52 dBm	1 MHz	
	1626.5 – 1660.5 MHz	-49 dBm	1 MHz	
UTRA FDD Band XXV or E-UTRA Band 25	1930 - 1995 MHz	-52 dBm	1 MHz	This requirement does not apply to UTRA FDD repeater operating in band II or band XXV.
	1850 - 1915 MHz	-49 dBm	1 MHz	This requirement does not apply to the UL of the UTRA FDD repeater operating in band XXV since it is already covered by the requirement in sub-clause 9.1.3. For UTRA FDD repeater operating in band II, it applies for 1910 MHz to 1915 MHz, while the rest is covered in sub-clause 9.1.3.
NOTE 1: The co-existence requirements do not apply for the 10 MHz frequency range immediately outside the repeaters operating band (see Table 5.1). Emission limits for this excluded frequency range may be covered by local or regional requirements.				
NOTE 2: The table above assumes that two operating bands, where the frequency ranges would be overlapping, are not deployed in the same geographical area. For such a case of operation with overlapping frequency arrangements in the same geographical area, special co-existence requirements may apply that are not covered by the 3GPP specifications.				

## 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, E-UTRA FDD and/or UTRA FDD BS 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	This requirement does not apply to the UL of UTRA FDD Repeater operating in band VIII. The sub-clause 9.1.3 requirement applies, but requires a 75dB coupling loss between BS and the repeater UL transmit port.
DCS1800	1710 - 1785 MHz	-98 dBm	100 kHz	This requirement does not apply to the UL of UTRA FDD Repeater operating in band III. The sub-clause 9.1.3 requirement applies, but requires a 75dB coupling loss between BS and the repeater UL transmit port.
PCS1900	1850 - 1910 MHz	-98 dBm	100 kHz	This requirement does not apply to the UL of UTRA FDD Repeater operating in band II or band XXV. The sub-clause 9.1.3 requirement applies, but requires a 75dB coupling loss between BS and the repeater UL transmit port.
GSM850 or CDMA850	824 - 849 MHz	-98 dBm	100 kHz	This requirement does not apply to the UL of UTRA FDD Repeater operating in band V. The sub-clause 9.1.3 requirement applies, but requires a 75dB coupling loss between BS and the repeater UL transmit port.
UTRA FDD Band I or E-UTRA Band 1	1920 - 1980 MHz	-96 dBm	100 kHz	This requirement does not apply to the UL of UTRA FDD Repeater operating in band I. The sub-clause 9.1.3 requirement applies, but requires a 73dB coupling loss between BS and the repeater UL transmit port.
UTRA FDD Band II or E-UTRA Band 2	1850 - 1910 MHz	-96 dBm	100 kHz	This requirement does not apply to the UL of UTRA FDD Repeater operating in band II or band XXV. The sub-clause 9.1.3 requirement applies, but requires a 73dB coupling loss between BS and the repeater UL transmit port.
UTRA FDD Band III or E-UTRA Band 3	1710 - 1785 MHz	-96 dBm	100 kHz	This requirement does not apply to the UL of UTRA FDD Repeater operating in band III or band IX. The sub-clause 9.1.3 requirement applies, but requires a 73dB coupling loss between BS and the repeater UL transmit port.
UTRA FDD Band IV or E-UTRA Band 4	1710 - 1755 MHz	-96 dBm	100 kHz	This requirement does not apply to the UL of UTRA FDD Repeater operating in band IV or band X. The sub-clause 9.1.3 requirement applies, but requires a 73dB coupling loss between BS and the repeater UL transmit port.
UTRA FDD Band V or E-UTRA Band 5	824 - 849 MHz	-96 dBm	100 kHz	This requirement does not apply to the UL of UTRA FDD Repeater operating in band V. The sub-clause 9.1.3 requirement applies, but requires a 73dB coupling loss between BS and the repeater UL transmit port.
UTRA FDD Band VI or XIX or E-UTRA Band 6, 18 or 19	815 - 830 MHz	-96 dBm	100 kHz	This requirement does not apply to the UL of UTRA FDD Repeater operating in band V, XVII or XX. The sub-clause 9.1.3 requirement applies, but requires a 73dB coupling loss between BS and the repeater UL transmit port.
	830 – 850 MHz	-96 dBm	100 kHz	This requirement does not apply to the UL of UTRA FDD Repeater operating in band V, VI, XIX or XX. The sub-clause 9.1.3 requirement applies, but requires a 73dB coupling loss between BS and the repeater UL transmit port.



UTRA FDD Band VII or E-UTRA Band 7	2500 - 2570 MHz	-96 dBm	100 kHz	This requirement does not apply to the UL of UTRA FDD Repeater operating in band VII. The sub-clause 9.1.3 requirement applies, but requires a 73dB coupling loss between BS and the repeater UL transmit port.
UTRA FDD Band VIII or E-UTRA Band 8	880 - 915 MHz	-96 dBm	100 kHz	This requirement does not apply to the UL of UTRA FDD Repeater operating in band VIII. The sub-clause 9.1.3 requirement applies, but requires a 73dB coupling loss between BS and the repeater UL transmit port.
UTRA FDD Band IX or E-UTRA Band 9	1749.9 - 1784.9 MHz	-96 dBm	100 kHz	This requirement does not apply to the UL of UTRA FDD Repeater operating in band III or band IX. The sub-clause 9.1.3 requirement applies, but requires a 73dB coupling loss between BS and the repeater UL transmit port.
UTRA FDD Band X or E-UTRA Band 10	1710 - 1770 MHz	-96 dBm	100 kHz	This requirement does not apply to the UL of UTRA FDD Repeater operating in band IV or band X. The sub-clause 9.1.3 requirement applies, but requires a 73dB coupling loss between BS and the repeater UL transmit port.
UTRA FDD Band XI or XXI or E-UTRA Band 11 or 21	1427.9 - 1447.9 MHz	-96 dBm	100 kHz	This requirement does not apply to the UL of UTRA FDD Repeater operating in band XI. The sub-clause 9.1.3 requirement applies, but requires a 73dB coupling loss between BS and the repeater UL transmit port.
	1447.9 - 1462.9 MHz	-96 dBm	100 kHz	This requirement does not apply to the UL of UTRA FDD Repeater operating in band XXI. The sub-clause 9.1.3 requirement applies, but requires a 73dB coupling loss between BS and the repeater UL transmit port.
UTRA FDD Band XII or E-UTRA Band 12	698 - 716 MHz	-96 dBm	100 kHz	This requirement does not apply to the UL of UTRA FDD Repeater operating in band XII. The sub-clause 9.1.3 requirement applies, but requires a 73dB coupling loss between BS and the repeater UL transmit port.
UTRA FDD Band XIII or E-UTRA Band 13	777 - 787 MHz	-96 dBm	100 kHz	This requirement does not apply to the UL of UTRA FDD Repeater operating in band XIII. The sub-clause 9.1.3 requirement applies, but requires a 73dB coupling loss between BS and the repeater UL transmit port.
UTRA FDD Band XIV or E-UTRA Band 14	788 - 798 MHz	-96 dBm	100 kHz	This requirement does not apply to the UL of UTRA FDD Repeater operating in band XIV. The sub-clause 9.1.3 requirement applies, but requires a 73dB coupling loss between BS and the repeater UL transmit port.
E-UTRA Band 17	704 - 716 MHz	-96 dBm	100 kHz	This requirement does not apply to the UL of UTRA FDD Repeater operating in band XII. The sub-clause 9.1.3 requirement applies, but requires a 73dB coupling loss between BS and the repeater UL transmit port.
UTRA FDD Band XX or E-UTRA Band 20	832 – 862 MHz	-96 dBm	100 kHz	This requirement does not apply to the UL of UTRA FDD Repeater operating in band XX. The sub-clause 9.1.3 requirement applies, but requires a 73dB coupling loss between BS and the repeater UL transmit port.
UTRA FDD Band XXII or E-UTRA Band 22	3410 - 3490 MHz	-96 dBm	100 kHz	This requirement does not apply to the UL of UTRA FDD Repeater operating in band XXII. The sub-clause 9.1.3 requirement applies, but requires a 73dB coupling loss between BS and the repeater UL transmit port.
E-UTRA Band 23	2000 - 2020 MHz	-96 dBm	100 kHz	
E-UTRA Band 24	1626.5 - 1660.5 MHz	-96 dBm	100 kHz	

UTRA FDD Band XXV or E-UTRA Band 25	1850 - 1915 MHz	-96 dBm	100 kHz	This requirement does not apply to the UL of UTRA FDD Repeater operating in band XXV. The sub-clause 9.1.3 requirement applies, but requires a 73dB coupling loss between BS and the repeater UL transmit port. For UTRA FDD Repeater operating in band 2, it applies from 1910MHz to 1915MHz, while the rest is covered in sub-clause 9.1.3, but requires a 73dB coupling loss between BS and the repeater UL transmit port.
NOTE 1: The co-location requirements do not apply for the 10 MHz frequency range immediately outside the repeater operating band (see Table 5.1). The current state-of-the-art technology does not allow a single generic solution for co-location with other system on adjacent frequencies for 30 dB UTRA Repeater-BS minimum coupling loss. However, there are certain site-engineering solutions that can be used. These techniques are addressed in TR 25.942 [5].				
NOTE 2: The table above assumes that two operating bands, where the frequency ranges would be overlapping, are not deployed in the same geographical area. For such a case of operation with overlapping frequency arrangements in the same geographical area, special co-existence requirements may apply that are not covered by the 3GPP specifications.				

## 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 - 1915,7 MHz	-41 dBm	300 kHz	

## 9.2.6 Co-existence with UTRA-TDD and/or E-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/or E-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 and/or E-UTRA TDD**

Band	Maximum Level	Measurement Bandwidth	Note
1900 - 1920 MHz	-52 dBm	1 MHz	
2010 - 2025 MHz	-52 dBm	1 MHz	
2570 - 2610 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 and/or E-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	-52 dBm	1 MHz	
2570 - 2610 MHz	-53 dBm	100 kHz	This requirement is applied only to UTRA FDD Repeater operating in band VII.
2570 - 2610 MHz	-52 dBm	1 MHz	This requirement does not apply to UTRA FDD Repeater operating in band VII.

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 and/or E-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 and/or E-UTRA TDD BS receiver**

Band	Maximum Level	Measurement Bandwidth	Note
1900 - 1920 MHz	-86 dBm	1 MHz	
2010 - 2025 MHz	-86 dBm	1 MHz	
2570 - 2610 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 and/or E-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.
2570 - 2610 MHz	-53 dBm	100 kHz	This requirement is applied only to UTRA FDD Repeater operating in band VII.
2570 - 2610 MHz	-86 dBm	1 MHz	This requirement does not apply to UTRA FDD Repeater operating in band VII.

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 Void

## 9.2.8 Protection of public safety operations

This requirement shall be applied to Repeater operating in Bands XIII and XIV to ensure that appropriate interference protection is provided to 700 MHz public safety operations. This requirement is also applicable at specified frequencies falling between 12.5 MHz below the first carrier frequency used and 12.5 MHz above the last carrier frequency used.

### 9.2.8.1 Minimum Requirement

The power of any spurious emission shall not exceed:

**Table 9.16: Spurious emissions limits for the up-link and down-link of UTRA Repeater for protection of public safety operations**

Operating Band	Band	Maximum Level	Measurement Bandwidth	Note
XIII	763 - 775 MHz	-46 dBm	6.25 kHz	
XIII	793 - 805 MHz	-46 dBm	6.25 kHz	
XIV	769 - 775 MHz	-46 dBm	6.25 kHz	
XIV	799 - 805 MHz	-46 dBm	6.25 kHz	

## 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.

### 10.3 Relative Code Domain Error (RCDE) for 64QAM modulation

The Relative Code Domain Error is computed by projecting the error vector (as defined in 10.1) onto the code domain at a specified spreading factor. Only the active code channels in the composite reference waveform are considered for this requirement. The Relative Code Domain Error for every active code is defined as the ratio of the mean power of the error projection onto that code, to the mean power of the active code in the composite reference waveform. This ratio is expressed in dB. The measurement interval is one frame.

The requirement for Relative Code Domain Error is only applicable for Repeater supporting 64QAM modulated codes.

### 10.3.1 Minimum requirement

The average Relative Code Domain Error for 64QAM modulated codes shall not exceed -21 dB at spreading factor 16.

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## 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 be 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 3<sup>rd</sup> order intermodulation product is positioned in the centre of the pass band.

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

- $f_{\text{offset}}$  is the separation between the centre frequency of first or last 5 MHz channel in the pass band and one of the interfering signals.

**Table 11.1: Input intermodulation requirement**

$f_{\text{offset}}$	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 requirement shall be met with the repeater operating at maximum gain.

#### 11.2.1 Minimum requirements - Co-location with GSM, DCS, PCS, UTRA FDD and/or E-UTRA FDD

This additional input intermodulation requirement may be applied for the protection of FDD Repeater input when GSM900, DCS1800, PCS1900, GSM850, E-UTRA FDD and/or UTRA FDD BS 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 product corresponds to the 4<sup>th</sup> and 3<sup>rd</sup> order for the GSM 900 and DCS 1800 bands, respectively.

Table 11.2: Input intermodulation requirements for interfering signals in other systems

Co-located other systems	Frequency of interfering signals	Interfering Signal Levels	Type of signals	Measurement bandwidth	Note
GSM900	921 - 960 MHz	+16 dBm	2 CW carriers	1 MHz	This requirement does not apply to UTRA FDD Repeater operating in band VIII, since it is already covered by the requirement in sub-clause 11.1, but requires a 86dB coupling loss between BS and the repeater DL receive port.
DCS1800	1805 - 1880 MHz	+16 dBm	2 CW carriers	1 MHz	This requirement does not apply to UTRA FDD Repeater operating in band III, since it is already covered by the requirement in sub-clause 11.1, but requires a 86dB coupling loss between BS and the repeater DL receive port.
PCS1900	1930 - 1990 MHz	+16 dBm	2 CW carriers	1 MHz	This requirement does not apply to UTRA FDD Repeater operating in band II or band XXV, since it is already covered by the requirement in sub-clause 11.1, but requires a 86dB coupling loss between BS and the repeater DL receive port.
GSM850 or CDMA850	869 - 894 MHz	+16 dBm	2 CW carriers	1 MHz	This requirement does not apply to UTRA FDD Repeater operating in band V, since it is already covered by the requirement in sub-clause 11.1, but requires a 86dB coupling loss between BS and the repeater DL receive port.
UTRA-FDD Band I or E-UTRA Band 1	2110 - 2170 MHz	+16 dBm	2 CW carriers	1 MHz	This requirement does not apply to UTRA FDD Repeater operating in band I, since it is already covered by the requirement in sub-clause 11.1, but requires a 86dB coupling loss between BS and the repeater DL receive port.
UTRA-FDD Band II or E-UTRA Band 2	1930 - 1990 MHz	+16 dBm	2 CW carriers	1 MHz	This requirement does not apply to UTRA FDD Repeater operating in band II or band XXV, since it is already covered by the requirement in sub-clause 11.1, but requires a 86dB coupling loss between BS and the repeater DL receive port.
UTRA-FDD Band III or E-UTRA Band 3	1805 - 1880 MHz	+16 dBm	2 CW carriers	1 MHz	This requirement does not apply to UTRA FDD Repeater operating in band III or band IX, since it is already covered by the requirement in sub-clause 11.1, but requires a 86dB coupling loss between BS and the repeater DL receive port.
UTRA-FDD Band IV or E-UTRA Band 4	2110 - 2155 MHz	+16 dBm	2 CW carriers	1 MHz	This requirement does not apply to UTRA FDD Repeater operating in band IV or band X, since it is already covered by the requirement in sub-clause 11.1, but requires a 86dB coupling loss between BS and the repeater DL receive port.
UTRA-FDD Band V or E-UTRA Band 5	869 - 894 MHz	+16 dBm	2 CW carriers	1 MHz	This requirement does not apply to UTRA FDD Repeater operating in band V, since it is already covered by the requirement in sub-clause 11.1, but requires a 86dB coupling loss between BS and the repeater DL receive port.
UTRA-FDD Band VI or XIX or E-UTRA Band 6, 18 or 19	860 - 895 MHz	+16 dBm	2 CW carriers	1 MHz	This requirement does not apply to UTRA FDD Repeater operating in band VI or band XIX, since it is already covered by the requirement in sub-clause 11.1, but requires a 86dB coupling loss between BS and the repeater DL receive port.
UTRA-FDD Band VII or E-UTRA	2620 - 2690 MHz	+16 dBm	2 CW carriers	1 MHz	This requirement does not apply to UTRA FDD Repeater operating in band VII, since it is already covered by the requirement in

Band 7					sub-clause 11.1, but requires a 86dB coupling loss between BS and the repeater DL receive port.
UTRA-FDD Band VIII or E-UTRA Band 8	925 - 960 MHz	+16 dBm	2 CW carriers	1 MHz	This requirement does not apply to UTRA FDD Repeater operating in band VIII, since it is already covered by the requirement in sub-clause 11.1, but requires a 86dB coupling loss between BS and the repeater DL receive port.
UTRA-FDD Band IX or E-UTRA Band 9	1844.9 - 1879.9 MHz	+16 dBm	2 CW carriers	1 MHz	This requirement does not apply to UTRA FDD Repeater operating in band III or band IX, since it is already covered by the requirement in sub-clause 11.1, but requires a 86dB coupling loss between BS and the repeater DL receive port.
UTRA-FDD Band X or E-UTRA Band 10	2110 - 2170 MHz	+16 dBm	2 CW carriers	1 MHz	This requirement does not apply to UTRA FDD Repeater operating in band IV or band X, since it is already covered by the requirement in sub-clause 11.1, but requires a 86dB coupling loss between BS and the repeater DL receive port.
UTRA-FDD Band XI or XXI or E-UTRA Band 11 or 21	1475.9 - 1510.9 MHz	+16 dBm	2 CW carriers	1 MHz	This requirement does not apply to UTRA FDD Repeater operating in band XI or band XXI, since it is already covered by the requirement in sub-clause 11.1, but requires a 86dB coupling loss between BS and the repeater DL receive port.
UTRA-FDD Band XII or E-UTRA Band 12	728 - 746 MHz	+16 dBm	2 CW carriers	1 MHz	This requirement does not apply to UTRA FDD Repeater operating in band XII, since it is already covered by the requirement in sub-clause 11.1, but requires a 86dB coupling loss between BS and the repeater DL receive port.
UTRA-FDD Band XIII or E-UTRA Band 13	746 - 756 MHz	+16 dBm	2 CW carriers	1 MHz	This requirement does not apply to UTRA FDD Repeater operating in band XIII, since it is already covered by the requirement in sub-clause 11.1, but requires a 86dB coupling loss between BS and the repeater DL receive port.
UTRA-FDD Band XIV or E-UTRA Band 14	758 - 768 MHz	+16 dBm	2 CW carriers	1 MHz	This requirement does not apply to UTRA FDD Repeater operating in band XIV, since it is already covered by the requirement in sub-clause 11.1, but requires a 86dB coupling loss between BS and the repeater DL receive port.
E-UTRA Band 17	734 - 746 MHz	+16 dBm	2 CW carriers	1 MHz	This requirement does not apply to UTRA FDD Repeater operating in band XII, since it is already covered by the requirement in sub-clause 11.1, but requires a 86dB coupling loss between BS and the repeater DL receive port.
UTRA-FDD Band XX or E-UTRA Band 20	791 - 821 MHz	+16 dBm	2 CW carriers	1 MHz	This requirement does not apply to UTRA FDD Repeater operating in band XX, since it is already covered by the requirement in sub-clause 11.1, but requires a 86dB coupling loss between BS and the repeater DL receive port.
UTRA-FDD Band XXII or E-UTRA Band 22	3510 - 3590 MHz	+16 dBm	2 CW carriers	1 MHz	This requirement does not apply to UTRA FDD Repeater operating in band XXII, since it is already covered by the requirement in sub-clause 11.1, but requires a 86dB coupling loss between BS and the repeater DL receive port.
E-UTRA Band 23	2180 - 2200 MHz	+16 dBm	2 CW carriers	1 MHz	
E-UTRA Band 24	1525 - 1559 MHz	+16 dBm	2 CW carriers	1 MHz	
UTRA-FDD	1930 - 1995	+16 dBm	2 CW	1 MHz	This requirement does not apply to UTRA



Band XXV or E UTRA Band 25	MHz		carriers		FDD Repeater operating in band XXV, since it is already covered by the requirement in sub-clause 11.1, but requires a 86dB coupling loss between BS and the repeater DL receive port. For UTRA FDD Repeater operating in band II, it applies fro 1990MHz to 1995MHz, while the rest is covered in sub-clause 11.1, but requires a 86dB coupling loss between BS and the repeater DL transmit port.
NOTE 1: The co-location requirements in the table 11.2 do not apply when the repeaters pass band frequency range is adjacent to the frequency range of the co-location requirement in the table 11.2. The current state-of-the-art technology does not allow a single generic solution for co-location with other system on adjacent frequencies for 30 dB Repeater-BS minimum coupling loss. However, there are certain site-engineering solutions that can be used. These techniques are addressed in TR 25.942 [5].					

## 11.2.2 Minimum Requirement - Co-location with UTRA-TDD and/or E-UTRA TDD

An additional input intermodulation requirement may be applied for the protection of FDD BS receivers when UTRA TDD and/or E-UTRA TDD is co-located with a UTRA FDD Repeater.

The requirements in this chapter assume a 30 dB coupling loss between transmitter and receiver.

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].

**Table 11.2A: Input intermodulation requirements for interfering signals in UTRA TDD systems**

Co-located other system	Frequency of interfering signals	Interfering Signal Levels	Type of signals	Measurement bandwidth
UTRA-TDD Band d) and E-UTRA TDD Band 38	2585 - 2620 MHz	+16 dBm	2 CW carriers	1 MHz

## 11.3 Co-existence with other systems

The following requirement may be applied when GSM 900, DCS 1800, PCS1900, GSM850, E-UTRA FDD 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 product corresponds to the 4<sup>th</sup> and 3<sup>rd</sup> order for the GSM 900 and DCS 1800 bands, respectively.

Table 11.3: Input intermodulation requirements for interfering signals in other systems

Co-existence with other systems	Frequency of interfering signals	Interfering Signal Levels	Type of signals	Measurement bandwidth	Note
GSM900	876 - 915 MHz	-15 dBm	2 CW carriers	1 MHz	This requirement does not apply to UTRA FDD Repeater operating in band VIII, since it is already covered by the requirement in sub-clause 11.1.
DCS1800	1710 - 1785 MHz	-15 dBm	2 CW carriers	1 MHz	This requirement does not apply to UTRA FDD Repeater operating in band III, since it is already covered by the requirement in sub-clause 11.1.
PCS1900	1850 - 1910 MHz	-15 dBm	2 CW carriers	1 MHz	This requirement does not apply to UTRA FDD Repeater operating in band II or band XXV, since it is already covered by the requirement in sub-clause 11.1.
GSM850 or CDMA850	824 - 849 MHz	-15 dBm	2 CW carriers	1 MHz	This requirement does not apply to UTRA FDD Repeater operating in band V, since it is already covered by the requirement in sub-clause 11.1.
UTRA-FDD Band I or E-UTRA Band 1	1920 - 1980 MHz	-15 dBm	2 CW carriers	1 MHz	This requirement does not apply to UTRA FDD Repeater operating in band I, since it is already covered by the requirement in sub-clause 11.1.
UTRA-FDD Band II or E-UTRA Band 2	1850 - 1910 MHz	-15 dBm	2 CW carriers	1 MHz	This requirement does not apply to UTRA FDD Repeater operating in band II or band XXV, since it is already covered by the requirement in sub-clause 11.1.
UTRA-FDD Band III or E-UTRA Band 3	1710 - 1785 MHz	-15 dBm	2 CW carriers	1 MHz	This requirement does not apply to UTRA FDD Repeater operating in band III or band IX, since it is already covered by the requirement in sub-clause 11.1.
UTRA-FDD Band IV or E-UTRA Band 4	1710 - 1755 MHz	-15 dBm	2 CW carriers	1 MHz	This requirement does not apply to UTRA FDD Repeater operating in band IV or band X, since it is already covered by the requirement in sub-clause 11.1.
UTRA-FDD Band V or E-UTRA Band 5	824 - 849 MHz	-15 dBm	2 CW carriers	1 MHz	This requirement does not apply to UTRA FDD Repeater operating in band V, since it is already covered by the requirement in sub-clause 11.1.
UTRA-FDD Band VI or XIX or E-UTRA Band 6, 18 or 19	815 - 850 MHz	-15 dBm	2 CW carriers	1 MHz	This requirement does not apply to UTRA FDD Repeater operating in band VI or band XIX, since it is already covered by the requirement in sub-clause 11.1.
UTRA-FDD Band VII or E-UTRA Band 7	2500 - 2570 MHz	-15 dBm	2 CW carriers	1 MHz	This requirement does not apply to UTRA FDD Repeater operating in band VII, since it is already covered by the requirement in sub-clause 11.1.
UTRA-FDD Band VIII or E-UTRA Band 8	880 - 915 MHz	-15 dBm	2 CW carriers	1 MHz	This requirement does not apply to UTRA FDD Repeater operating in band VIII, since it is already covered by the requirement in sub-clause 11.1.
UTRA-FDD Band IX or E-UTRA Band 9	1749,9 - 1784,9 MHz	-15 dBm	2 CW carriers	1 MHz	This requirement does not apply to UTRA FDD Repeater operating in band III or band IX, since it is already covered by the requirement in sub-clause 11.1.
UTRA-FDD Band X or E-UTRA Band 10	1710 - 1770 MHz	-15 dBm	2 CW carriers	1 MHz	This requirement does not apply to UTRA FDD Repeater operating in band IV or band X, since it is already covered by the requirement in sub-clause 11.1.
UTRA-FDD Band XI or XXI or E-UTRA Band 11 or 21	1427,9 - 1447,9 MHz	-15 dBm	2 CW carriers	1 MHz	This requirement does not apply to UTRA FDD Repeater operating in band XI, since it is already covered by the requirement in sub-clause 11.1.

	1447.9 - 1462.9 MHz	-15 dBm	2 CW carriers	1 MHz	This requirement does not apply to UTRA FDD Repeater operating in band XXI, since it is already covered by the requirement in sub-clause 11.1.
UTRA-FDD Band XII or E-UTRA Band 12	698 - 716 MHz	-15 dBm	2 CW carriers	1 MHz	This requirement does not apply to UTRA FDD Repeater operating in band XII, since it is already covered by the requirement in sub-clause 11.1.
UTRA-FDD Band XIII or E-UTRA Band 13	777 - 787 MHz	-15 dBm	2 CW carriers	1 MHz	This requirement does not apply to UTRA FDD Repeater operating in band XIII, since it is already covered by the requirement in sub-clause 11.1.
UTRA-FDD Band XIV or E-UTRA Band 14	788 - 798 MHz	-15 dBm	2 CW carriers	1 MHz	This requirement does not apply to UTRA FDD Repeater operating in band XIV, since it is already covered by the requirement in sub-clause 11.1.
E-UTRA Band 17	704 - 716 MHz	-15 dBm	2 CW carriers	1 MHz	This requirement does not apply to UTRA FDD Repeater operating in band XII, since it is already covered by the requirement in sub-clause 11.1.
UTRA-FDD Band XX or E-UTRA Band 20	832 - 862 MHz	-15 dBm	2 CW carriers	1 MHz	This requirement does not apply to UTRA FDD Repeater operating in band XX, since it is already covered by the requirement in sub-clause 11.1.
UTRA-FDD Band XXII or E-UTRA Band 22	3410 - 3490 MHz	-15 dBm	2 CW carriers	1 MHz	This requirement does not apply to UTRA FDD Repeater operating in band XXII, since it is already covered by the requirement in sub-clause 11.1.
E-UTRA Band 23	2000 - 2020 MHz	-15 dBm	2 CW carriers	1 MHz	
E-UTRA Band 24	1626.5 – 1660.5 MHz	-15 dBm	2 CW carriers	1 MHz	
UTRA-FDD Band XXV or E-UTRA Band 25	1850 - 1915 MHz	-15 dBm	2 CW carriers	1 MHz	This requirement does not apply to UTRA FDD Repeater operating in band XXV, since it is already covered by the requirement in sub-clause 11.1. For UTRA FDD Repeater operating in band II, it applies from 1910MHz to 1915MHz, while the rest is covered in sub-clause 11.1.

NOTE 1: The co-existence requirements in Table 11.3 do not apply when the repeaters pass band frequency range is adjacent to the frequency range of the co-existence requirement in the Table 11.3. The current state-of-the-art technology does not allow a single generic solution for co-existence.

## 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  $\pm 5$  MHz,  $\pm 10$  MHz and  $\pm 15$  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
$P \geq 31$ dBm	5 MHz	33dB
$P \geq 31$ dBm	10 MHz	33dB
$P < 31$ dBm	5 MHz	20dB
$P < 31$ dBm	10 MHz	20dB

## Annex A (informative): Change History

TSG	Doc	CR	R	Title	Cat	Curr	New	Work Item
RP-31				Rel-7 version created; based on v6.4.0			7.0.0	
RP-31	RP-060100	0042	2	Introduction of operating band III to IX requirements in 25.106	B	6.3.0	7.0.0	TEI7
RP-31	RP-060110	0043		Correction of spurious emissions for coexistence with GSM900 in same geographic area	F	6.3.0	7.0.0	RInImp-UMTS900
RP-33	RP-060520	0046	1	Clean up of Spurious emissions	A	7.0.0	7.1.0	TEI5
RP-33	RP-060521	0049	1	New UTRA Repeater up-link spurious emissions limits for co-existence/co-location with TDD	A	7.0.0	7.1.0	TEI5
RP-34	RP-060811	0052	1	Corrections to input intermodulation	A	7.1.0	7.2.0	TEI5
RP-36	RP-070370	0056		Category B spurious emission limits for UTRA Repeater	A	7.2.0	7.3.0	TEI4
RP-36	RP-070373	0057		Introduction of operating band X into the repeater specification	B	7.2.0	7.3.0	TEI7
RP-39	RP-080126	0058		Introduction of UMTS1500 requirements	B	7.3.0	8.0.0	RInImp8-UMTS1500
				Minor correction to CR implementation		8.0.0	8.0.1	
				Update of history table		8.0.1	8.0.2	
RP-42	RP-080943	60	1	Introduction of operating band unwanted emission	F	8.0.2	8.1.0	TEI8
RP-45	RP-080819	61		Introduction of band XII, XIII, XIV	F	8.1.0	8.2.0	TEI8
RP-45	RP-080819	62		CR to limit the scope to FDD only to 25.106	F	8.1.0	8.2.0	TEI8
RP-46	RP-091277	063		Corrections on additional spectrum emission limits for Bands XII, XIII, XIV	F	8.2.0		TEI8
				Automatic upgrade from previous Release		8.3.0	9.0.0	TEI9
RP-49	RP-100925	064		Introduction of operating band XIX, XX and XXI and correction of band XI	F	9.0.0	9.1.0	TEI9
RP-49	RP-100913	067	1	RCDE for 64QAM modulated codes for FDD Repeater	A	9.0.0	9.1.0	TEI7
RP-50	RP-101336	072		Protection of cdma and E-UTRA bands	A	9.1.0	9.2.0	TEI8
RP-50	RP-101337	074		Removal of brackets	A	9.1.0	9.2.0	TEI8
RP-50	RP-101347	068		Remove test settings for unwanted emissions from core spec	F	9.1.0	9.2.0	TEI9
RP-50	RP-101347	069		Corrections to the symbols and abbreviations clause related to DTT requirement	F	9.1.0	9.2.0	TEI9
RP-50	RP-101347	070		Co-existence with services in adjacent frequency bands	F	9.1.0	9.2.0	TEI9
RP-51	RP-110352	0075	-	Inclusion of E-UTRA TDD text to co-location on 25.106	F	9.2.0	10.0.0	TEI10
RP-55	RP-120303	078	1	Correction on the table of Regional requirements	F	10.0.0	10.1.0	TEI10
RP-55	RP-120303	079	1	Introduction of operating frequency band XXII	B	10.0.0	10.1.0	TEI10
RP-55	RP-120303	080	1	Introduction of operating frequency band XXV and protection limits towards E-UTRA Band 23	B	10.0.0	10.1.0	TEI10
RP-56	RP-120783	082	2	Update of the Definition clause with repeaters operating band definition and introduction of minor editorial changes for better alignment with BS core specification	F	10.1.0	10.2.0	TEI10
RP-56	RP-120765	085		Additional spurious emissions requirements for PHS	A	10.1.0	10.2.0	TEI8
RP-57	RP-121313	088	2	Introduction of missing Spurious Emission limits and Input Intermodulation requirements towards E-UTRA FDD Band 24	F	10.2.0	10.3.0	TEI10
SP-57	-	-	-	Update to Rel-11 version (MCC)	-	10.3.0	11.0.0	-

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## History

<b>Document history</b>		
V11.0.0	October 2012	Publication