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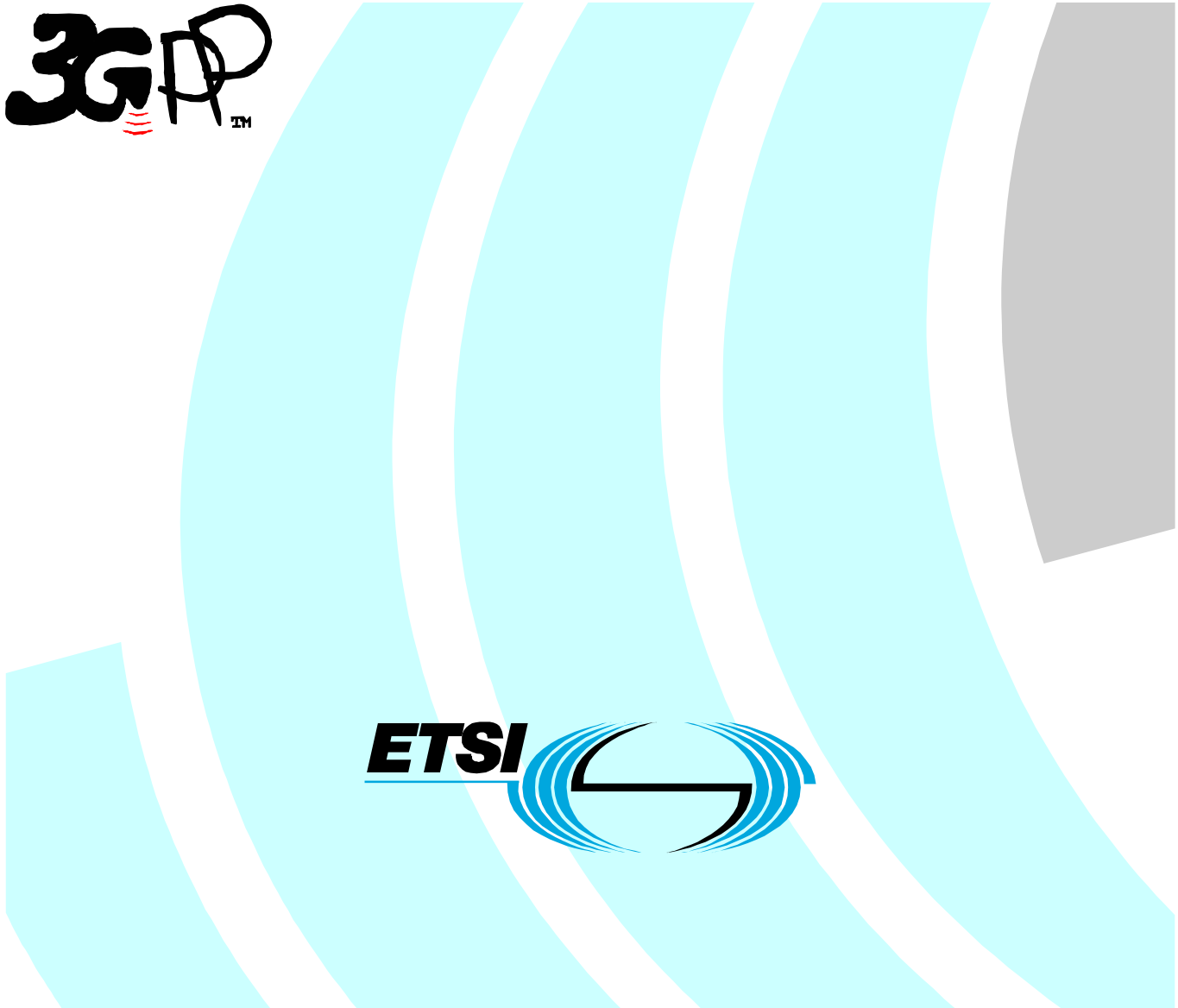
Technical Specification

Universal Mobile Telecommunications System (UMTS);
UTRA Repeater;
Radio transmission and reception
(3GPP TS 25.106 version 4.5.0 Release 4)



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650 Route des Lucioles
F-06921 Sophia Antipolis Cedex - FRANCE

Tel.: +33 4 92 94 42 00 Fax: +33 4 93 65 47 16

Siret N° 348 623 562 00017 - NAF 742 C
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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.
- 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.329-8: "Spurious emissions".

[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".

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 repeater can have one or several operating bands. The operating 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 operating 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 5.2 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.329-8 [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.329-8 [1], are applied.
9.2.3.1	Spurious emissions: Co-existence with GSM900 -Operation in the same geographic area	This requirement may be applied for the protection of GSM900 MS and GSM 900 BTS in geographic areas in which both GSM900 and UTRA FDD Repeaters are deployed.
9.2.3.2	Spurious emissions: Co-existence with GSM900 - Co-location	This requirement may be applied for the protection of GSM900 BTS receivers when GSM900 BTS and UTRA FDD Repeaters are co-located.
9.2.4.1	Spurious emissions: Co-existence with DCS1800 -Operation in the same geographic area	This requirement may be applied for the protection of DCS1800 MS and DCS 1800 BTS in geographic areas in which both DCS1800 and UTRA FDD Repeaters are deployed.
9.2.4.2	Spurious emissions: Co-existence with DCS1800 - Co-location	This requirement may be applied for the protection of DCS1800 BTS receivers when DCS1800 BTS and UTRA FDD Repeaters are co-located.
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.
11.2	Input Intermodulation: Co-location with GSM900 and/or DCS1800	The requirement may be applied when GSM900 BTS and/or DCS1800 BTS and UTRA-FDD Repeaters are co-located.

5 Frequency bands and channel arrangement

5.1 Frequency bands

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

(a) 1920 – 1980 MHz: Up-link (Mobile transmit, base receive)
2110 – 2170 MHz: Down-link (Base transmit, mobile receive)

(b) 1850 – 1910 MHz: Up-link (Mobile transmit, base receive)
1930 – 1990 MHz: Down-link (Base transmit, mobile receive)
(Note 1)

NOTE 1: Used in Region 2. Additional allocations in ITU region 2 are FFS.

NOTE 2: Deployment in other frequency bands is not precluded.

5.2 Up-link to down-link frequency separation

(a) The minimum up-link to down-link frequency separation is 134.8 MHz and the maximum value is 245.2 MHz and all UTRA/FDD repeaters shall support an up-link to down-link frequency separation of 190 MHz when operating in the paired frequency band defined in sub-clause 5.1(a).

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

(c) When operating in the paired frequency band defined in sub-clause 5.1(b), all UTRA/FDD repeaters shall support an up-link to down-link frequency separation of 80 MHz.

(d) 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, which means that the centre frequency must be an integer multiple of 200 kHz.

5.3.3 Channel number

The carrier frequency is designated by the UTRA Absolute Radio Frequency Channel Number (UARFCN). The value of the UARFCN in the IMT2000 band is defined as follows:

Table 5.1: UTRA Absolute Radio Frequency Channel Number

Up-link	$N_u = 5 * F_{uplink}$	0.0 MHz $\leq F_{uplink} \leq$ 3276.6 MHz where F_{uplink} is the up-link frequency in MHz
Down-link	$N_d = 5 * F_{downlink}$	0.0 MHz $\leq F_{downlink} \leq$ 3276.6 MHz where $F_{downlink}$ is the down-link frequency in MHz

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 operating 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 operating 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 operating 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 operating 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 operating 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 operating 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 operating 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 Δf = 2,5 MHz to Δf_{max} from the 5 MHz channel, where:

- Δf is the separation between the centre frequency of first or last 5 MHz channel used in the operating 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 operating 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.

- Δf_{max} is equal to f_offset_{max} minus half of the bandwidth of the measurement filter.

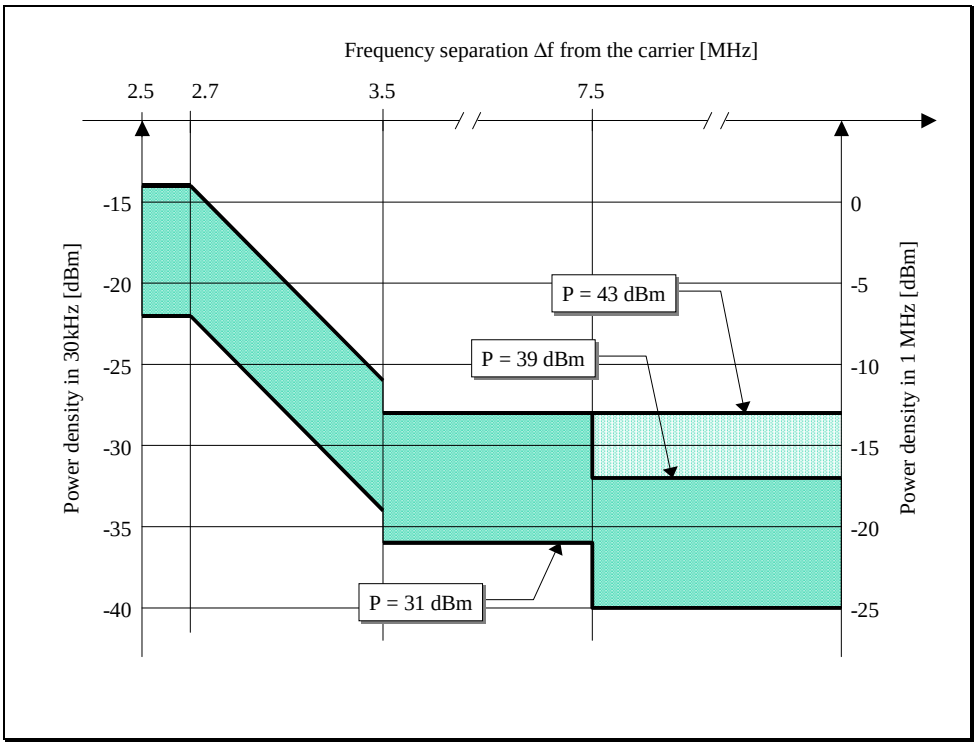

Figure 9.1: Illustrative diagram of spectrum emission mask

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	Maximum level	Measurement bandwidth
2,5 ≤ Δf < 2,7 MHz	2,515MHz ≤ f_offset < 2,715MHz	-14 dBm	30 kHz
2,7 ≤ Δf < 3,5 MHz	2,715MHz ≤ f_offset < 3,515MHz	- 14 - 15·(f_offset- 2.715) dBm	30 kHz
	3,515MHz ≤ f_offset < 4,0MHz	-26 dBm	30 kHz
3,5 ≤ Δf MHz	4,0MHz ≤ f_offset < f_offset_{max}	-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	Maximum level	Measurement bandwidth
2,5 ≤ Δf < 2,7 MHz	2,515MHz ≤ f_offset < 2,715MHz	-14 dBm	30 kHz
2,7 ≤ Δf < 3,5 MHz	2,715MHz ≤ f_offset < 3,515MHz	-14 - 15·(f_offset - 2,715) dBm	30 kHz
(see note)	3,515MHz ≤ f_offset < 4,0MHz	-26 dBm	30 kHz
3,5 ≤ Δf < 7,5 MHz	4,0MHz ≤ f_offset < 8,0MHz	-13 dBm	1 MHz
7,5 ≤ Δf MHz	8,0MHz ≤ f_offset < f_offset_{max}	P - 56 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	Maximum level	Measurement bandwidth
2,5 ≤ Δf < 2,7 MHz	2,515MHz ≤ f_offset < 2,715MHz	P - 53 dBm	30 kHz
2,7 ≤ Δf < 3,5 MHz	2,715MHz ≤ f_offset < 3,515MHz	P - 53 - 15·(f_offset - 2,715) dBm	30 kHz
(see note)	3,515MHz ≤ f_offset < 4,0MHz	P-65 dBm	30 kHz
3,5 ≤ Δf < 7,5 MHz	4,0MHz ≤ f_offset < 8,0MHz	P - 52 dBm	1 MHz
7,5 ≤ Δf MHz	8,0MHz ≤ f_offset < f_offset_{max}	P - 56 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	Maximum level	Measurement bandwidth
2,5 ≤ Δf < 2,7 MHz	2,515MHz ≤ f_offset < 2,715MHz	-22 dBm	30 kHz
2,7 ≤ Δf < 3,5 MHz	2,715MHz ≤ f_offset < 3,515MHz	-22 - 15·(f_offset - 2,715) dBm	30 kHz
(see note)	3,515MHz ≤ f_offset < 4,0MHz	-34 dBm	30 kHz
3,5 ≤ Δf < 7,5 MHz	4,0MHz ≤ f_offset < 8,0MHz	-21 dBm	1 MHz
7,5 ≤ Δf MHz	8,0MHz ≤ f_offset < f_offset_{max}	-25 dBm	1 MHz

NOTE: 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.

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 operating bands). It applies for all configurations foreseen by the manufacturer's specification.

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 operating band.

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.329-8 [1], are applied.

At maximum repeater gain, with WCDMA signals in the operating 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 operating 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.329-8, s4.1
150kHz – 30MHz		10 kHz	Bandwidth as in ITU-R SM.329-8, s4.1
30MHz – 1GHz		100 kHz	Bandwidth as in ITU-R SM.329-8, s4.1
1GHz – 12,75 GHz		1 MHz	Upper frequency as in ITU-R SM.329-8, s2.6

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.329-8 [1], are applied.

At maximum repeater gain, with WCDMA signals in the operating 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 and 9.7 for the down- and up-link, respectively. The requirements shall also apply at maximum gain without WCDMA signals in the operating 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: Down-link: General spurious emissions limits, Category B

Band	Maximum Level	Measurement Bandwidth	Note
9kHz ↔ 150kHz	-36 dBm	1 kHz	Bandwidth as in ITU-R SM.329-8, s4.1
150kHz ↔ 30MHz	- 36 dBm	10 kHz	Bandwidth as in ITU-R SM.329-8, s4.1
30MHz ↔ 1GHz	-36 dBm	100 kHz	Bandwidth as in ITU-R SM.329-8, s4.1
1GHz ↔ Fc1 - 60 MHz or 2100 MHz *whichever is the higher*	-30 dBm	1 MHz	Bandwidth as in ITU-R SM.329-8, s4.1
Fc1 – 60 MHz or 2100 MHz *whichever is the higher* ↔ Fc1 – 50 MHz or 2100 MHz *whichever is the higher*	-25 dBm	1 MHz	Specification in accordance with ITU-R SM.329-8, s4.1
Fc1 – 50 MHz or 2100 MHz *whichever is the higher* ↔ Fc2 + 50 MHz or 2180 MHz *whichever is the lower*	-15 dBm	1 MHz	Specification in accordance with ITU-R SM.329-8, s4.1
Fc2 + 50 MHz or 2180 MHz *whichever is the lower* ↔ Fc2 + 60 MHz or 2180 MHz *whichever is the lower*	-25 dBm	1 MHz	Specification in accordance with ITU-R SM.329-8, s4.1
Fc2 + 60 MHz or 2180 MHz *whichever is the lower* ↔ 12,75 GHz	-30 dBm	1 MHz	Bandwidth as in ITU-R SM.329-8, s4.1. Upper frequency as in ITU-R SM.329-8, s2.6

Table 9.7: Up-link: General spurious emissions limits, Category B

Band	Maximum Level	Measurement Bandwidth	Note
9kHz ↔ 150kHz	-36 dBm	1 kHz	Bandwidth as in ITU-R SM.329-8, s4.1
150kHz ↔ 30MHz	- 36 dBm	10 kHz	Bandwidth as in ITU-R SM.329-8, s4.1
30MHz ↔ 1GHz	-36 dBm	100 kHz	Bandwidth as in ITU-R SM.329-8, s4.1
1GHz ↔ Fc1 - 60 MHz or 1910 MHz *whichever is the higher*	-30 dBm	1 MHz	Bandwidth as in ITU-R SM.329-8, s4.1
Fc1 – 60 MHz or 1910 MHz *whichever is the higher* ↔ Fc1 – 50 MHz or 1910 MHz *whichever is the higher*	-25 dBm	1 MHz	Specification in accordance with ITU-R SM.329-8, s4.1
Fc1 – 50 MHz or 1910 MHz *whichever is the higher* ↔ Fc2 + 50 MHz or 1990 MHz *whichever is the lower*	-15 dBm	1 MHz	Specification in accordance with ITU-R SM.329-8, s4.1
Fc2 + 50 MHz or 1990 MHz *whichever is the lower* ↔ Fc2 + 60 MHz or 1990 MHz *whichever is the lower*	-25 dBm	1 MHz	Specification in accordance with ITU-R SM.329-8, s4.1
Fc2 + 60 MHz or 1990 MHz *whichever is the lower* ↔ 12,75 GHz	-30 dBm	1 MHz	Bandwidth as in ITU-R SM.329-8, s4.1. Upper frequency as in ITU-R SM.329-8, s2.6

Fc1: Centre frequency of emission of the first 5 MHz channel in an operating band.

Fc2: Centre frequency of emission of the last 5 MHz channel in an operating band.

9.2.2 Co-location with UTRA-FDD BS

This requirement may be applied for the protection of UTRA-FDD BS receivers when UTRA-FDD Repeater and UTRA-FDD BS are co-located. The requirement applies only to the down-link direction of the repeater.

9.2.2.1 Minimum Requirement

The power of any spurious emission shall not exceed:

Table 9.8: UTRA Repeater spurious emissions limits for protection of co-located UTRA FDD BS receiver

Band	Maximum Level	Measurement Bandwidth	Note
1920 - 1980MHz For operation in Frequency Bands defined in sub-clause 5.2(a)	-96 dBm	100 kHz	
1850-1910 MHz For operation in Frequency Bands defined in sub-clause 5.2(b)	-96 dBm	100kHz	

9.2.3 Co-existence with GSM 900

9.2.3.1 Operation in the same geographic area

This requirement may be applied for the protection of GSM 900 MS and GSM 900 BTS receivers in geographic areas in which both GSM 900 and UTRA-FDD Repeaters are deployed.

9.2.3.1.1 Minimum Requirement

The power of any spurious emission shall not exceed:

Table 9.9: UTRA Repeater spurious emissions limits in geographic coverage area of GSM 900 MS receiver

Band	Maximum Level	Measurement Bandwidth	Note
876 - 915 MHz	-61 dBm	100 kHz	
921 - 960 MHz	-57 dBm	100 kHz	

9.2.3.2 Co-located Repeaters and GSM 900 base stations

This requirement may be applied for the protection of GSM 900 BTS receivers when GSM 900 BTS and UTRA-FDD Repeaters are co-located.

9.2.3.2.1 Minimum Requirement

The power of any spurious emission shall not exceed:

Table 9.10: UTRA Repeater spurious emissions limits for Repeater co-located with GSM 900 BTS receiver

Band	Maximum Level	Measurement Bandwidth	Note
876-915 MHz	-98 dBm	100 kHz	

9.2.4 Co-existence with DCS 1800

9.2.4.1 Operation in the same geographic area

This requirement may be applied for the protection of DCS 1800 MS and DCS 1800 BTS receivers in geographic areas in which both DCS 1800 and UTRA-FDD Repeaters are deployed.

9.2.4.1.1 Minimum Requirement

The power of any spurious emission shall not exceed:

Table 9.11: UTRA Repeater spurious emissions limits in geographic coverage area of DCS 1800 MS receiver

Band	Maximum Level	Measurement Bandwidth	Note
1710 - 1785 MHz	-61 dBm	100 kHz	
1805 - 1880 MHz	-47 dBm	100 kHz	

9.2.4.2 Co-located Repeaters and DCS 1800 base stations

This requirement may be applied for the protection of DCS 1800 BTS receivers when DCS 1800 BTS and UTRA-FDD Repeaters are co-located.

9.2.4.2.1 Minimum Requirement

The power of any spurious emission shall not exceed:

Table 9.12: UTRA Repeater spurious emissions limits for Repeater co-located with DCS 1800 BTS

Band	Maximum Level	Measurement Bandwidth	Note
1710 - 1785 MHz	-98 dBm	100 kHz	

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.

9.2.5.1 Minimum Requirement

The power of any spurious emission shall not exceed:

Table 9.13: UTRA Repeater spurious emissions limits for in geographic coverage area of PHS

Band	Maximum Level	Measurement Bandwidth	Note
1893,5 - 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. The requirement applies only to the down-link direction of the repeater.

9.2.6.1.1 Minimum Requirement

The power of any spurious emission shall not exceed:

Table 9.14: UTRA Repeater 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	

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

9.2.6.2.1 Minimum Requirement

The power of any spurious emission shall not exceed:

Table 9.15: UTRA Repeater 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	

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 α=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 operating 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 operating band, in the presence of interfering signals on frequencies other than the operating band.

11.1 General Requirement

The following requirement applies for interfering signals in the frequency bands defined in sub-clause 5.1(a) or 5.1(b), depending on the repeaters operating 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 operating band, shall not increase with more than 10 dB at the output of the repeater as measured in the centre of the operating 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 operating 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 operating 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 GSM 900 and/or DCS 1800

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

For the parameters specified in table 11.2, the power in the operating band shall not increase with more than 10 dB at the output of the repeater as measured in the centre of the operating 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 operating 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 the GSM 900 and DCS 1800 bands

Frequency of interfering signals	Interfering Signal Levels	Type of signals	Measurement bandwidth
921 - 960 MHz	+16 dBm	2 CW carriers	1 MHz
1805 - 1880 MHz	+16 dBm	2 CW carriers	1 MHz

11.3 Co-existence with GSM 900 and/or DCS 1800

The following requirement may be applied when GSM 900 BTS and/or DCS 1800 BTS 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 operating band shall not increase with more than 10 dB at the output of the repeater as measured in the centre of the operating 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 operating band.

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

Table 11.3: Input intermodulation requirements for interfering signals in the GSM 900 and DCS 1800 bands

Frequency of interfering signals	Interfering Signal Levels	Type of signals	Measurement bandwidth
876 - 915 MHz	–15 dBm	2 CW carriers	1 MHz
1710 - 1785 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.

Annex A (informative): Change History

Table A.1: Document history

V0.0.1	2000-05-25	Document R4-000356 with a suggestion to V0.0.1 of this current specification approved at RAN WG4 #12
V1.0.0	2000-09-13	Inclusion of the text proposals approved by RAN WG4 #13 and submitted to RAN #9 for information.
V1.1.0	2000-11-24	Inclusion of the text proposals approved by RAN WG4 #14
V1.2.0	2001-01-31	Inclusion of the text proposals approved by RAN WG4 #15
V1.3.0	2001-02-26	Inclusion of the text proposals approved by RAN WG4 #16
V2.0.0	2001-03-08	Submitted to TSG_RAN#11 for approval
V4.0.0	2001-03-30	Approved by TSG RAN #11

Table A.2: CRs approved by TSG RAN#13

RAN Tdoc	Spec	CR	R	Ph	Title	Cat	Curr	New
RP-010628	25.106	1		Rel-4	Editorial changes	F	4.0.0	4.1.0
RP-010628	25.106	2		Rel-4	Clarification in spectrum emission mask	F	4.0.0	4.1.0

Table A.3: CRs approved by TSG RAN#16

RAN Tdoc	Spec	CR	R	Ph	Title	Cat	Curr	New
RP-020292	25.106	5		Rel-4	Introduction of output intermodulation requirement	F	4.1.0	4.2.0

Table A.4: CR approved by TSG RAN#17

RAN Tdoc	Spec	CR	R	Ph	Title	Cat	Curr	New
RP-020483	25.106	8	1	Rel-4	Out of band gain	F	4.2.0	4.3.0

Table A.5: CRs approved by TSG RAN#18

RAN Tdoc	Spec	CR	R	Ph	Title	Cat	Curr	New
RP-020795	25.106	011	1	Rel-4	Input intermodulation: Correction of co-location and addition of co-existence	F	4.3.0	4.4.0
RP-020785	25.106	015		Rel-4	Aligning of the requirement for "Output power" in extreme conditions with TS25.143	F	4.3.0	4.4.0
RP-020794	25.106	017		Rel-4	Out of band gain	F	4.3.0	4.4.0
RP-020861	25.106	019		Rel-4	EVM Test: Change requirement for the use of HSDPA.	F	4.3.0	4.4.0

Table A.6: CRs approved by TSG RAN#19

RAN Tdoc	Spec	CR	R	Ph	Title	Cat	Curr	New
RP-030036	25.106	020		Rel-4	FDD GSM co-existence in the Same Geographic Area	F	4.4.0	4.5.0

History

Document history		
V4.0.0	March 2001	Publication
V4.1.0	September 2001	Publication
V4.2.0	June 2002	Publication
V4.3.0	September 2002	Publication
V4.4.0	December 2002	Publication
V4.5.0	March 2003	Publication