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Abstract of document:

This technical report documents the work performed in WG4 on the new work item on Base Station Classification for 1.28 Mcps TDD option. The TR contains the RF system scenarios, criteria for BS classification, and the derivation of new requirements to be incorporated into the core specifications 25.105, 25.142 and 25.123.

Changes since last presentation to TSG-RAN Meeting:

Addition of requirement for adjacent leakage power. Correction to transmitter spurious emissions for co-existence with UTRA FDD.

Outstanding Issues:

None.

Contentious Issues:

None

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Technical Report

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Foreword

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

The contents of the present document are subject to continuing work within the TSG and may change following formal TSG approval. Should the TSG modify the contents of the present document, it will be re-released by the TSG with an identifying change of release date and an increase in version number as follows:

Version x.y.z

where:

x the first digit:

1 presented to TSG for information;

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3 or greater indicates TSG approved document under change control.

y the second digit is incremented for all changes of substance, i.e. technical enhancements, corrections, updates, etc.

z the third digit is incremented when editorial only changes have been incorporated in the document.

1 Scope

The present document is a Technical Report on Release 5 work item “Base Station Classification for 1,28 Mcps TDD option.

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] 3GPP TS 25.105: "UTRA (BS) TDD; Radio transmission and Reception".

[2] 3GPP TS 25.123: "Requirements for Support of Radio Resources Management (TDD)".

[3] 3GPP TS 25.142: "Base station conformance testing (TDD)"

[4] 3GPP TR 25.942: "RF System Scenarios"

[5] UMTS 30.03 / TR 101 112: "Selection procedures for the choice of radio transmission technologies of the UMTS"

3 Definitions, symbols and abbreviations

3.1 Definitions

void

3.2 Symbols

void

3.3 Abbreviations

void

4 General

Current TSG RAN WG4 specifications have been done according to the requirements for the macrocell base stations (NodeBs). For the UTRA evolution requirement specifications for other types of base stations are needed as well to take into account different use scenarios and radio environments. In this technical report, base station classification is described and requirements for each base station class are derived.

5 System scenarios

This section describes the system scenarios for UTRA operation that are considered when defining base station classes. It also includes typical radio parameters that are used to derive requirements.

5.1 Indoor Environment

5.1.1 Path Loss Model

The indoor path loss model expressed in dB is in the following form, which is derived from the COST 231 indoor model:

$$L = 37 + 20\ Log_{10}(R) + \Sigma\ k_{wi}\ L_{wi} + 18{,}3\ n^{((n+2)/(n+1)-0{,}46)}$$

where:

R = transmitter-receiver separation given in metres

k_{wi} = number of penetrated walls of type i

L_{wi} = loss of wall type i

n = number of penetrated floors

Two types of internal walls are considered. Light internal walls with a loss factor of 3,4 dB and regular internal walls with a loss factor of 6,9 dB.

If internal walls are not modelled individually, the indoor path loss model is represented by the following formula:

$$L = 37 + 30\ Log_{10}(R) + 18{,}3\ n^{((n+2)/(n+1)-0{,}46)}$$

where:

R = transmitter-receiver separation given in metres;

n = number of penetrated floors

Slow fading deviation in pico environment is assumed to be 6 dB.

5.2 Mixed Indoor – Outdoor Environment

5.2.1 Propagation Model

Distance attenuation inside a building is a pico cell model as defined in Chapter 5.1.1. In outdoors UMTS 30.03 model is used [5].

Attenuation from outdoors to indoors is sketched in Figure 5.1 below. In the figure star denotes receiving object and circle transmitting object. Receivers are projected to virtual positions. Attenuation is calculated using micro propagation model between transmitter and each virtual position. Indoor attenuation is calculated between virtual transmitters and the receiver. Finally, lowest pathloss is selected for further calculations. Only one floor is considered.

The total pathloss between outdoor transmitter and indoor receiver is calculated as

$$L = L_{micro} + L_{OW} + \Sigma\ k_{wi}\ L_{wi} + a * R\ ,$$

where:

L_{micro} = Micro cell pathloss according UMTS 30.03 Outdoor to Indoor and Pedestrian Test Environment pathloss model

L_{OW} = outdoor wall penetration loss [dB]

R = is the virtual transmitter-receiver separation given in metres;

k_{wi}= number of penetrated walls of type i;

L_{wi}= loss of wall type i;

a = 0,8 attenuation [dB/m]

<Editor Note: a reference to the source of the formula is required>

Slow fading deviation in mixed pico-micro environment shall be 6 dB.

Propagation from indoors to outdoors would be symmetrical with above models.

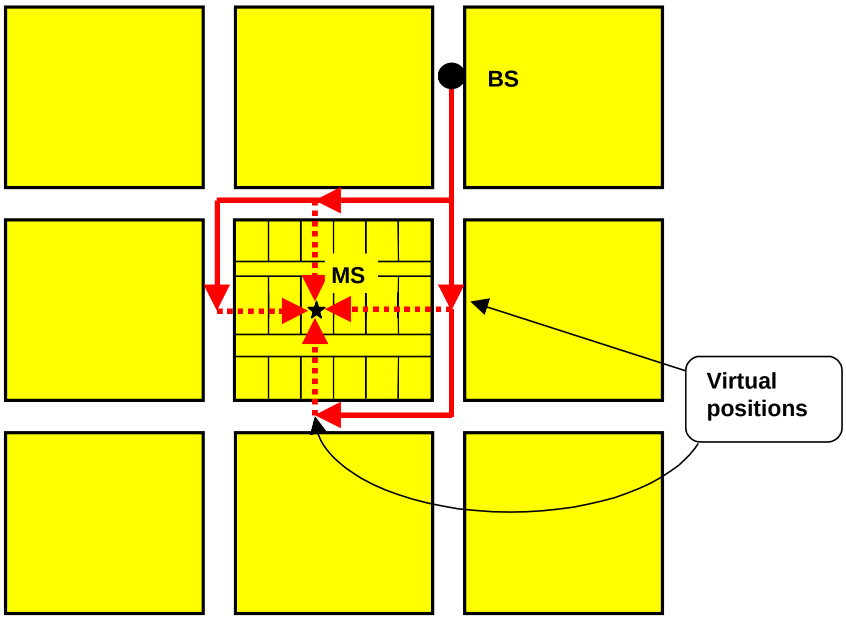

Figure 5.1: Simulation scenario and propagation model.

Parameters related to propagation models are summarised in Table 5.1.

Table 5.1: Parameters related to mixed indoor - outdoor propagation model

Parameter	Value
Inside wall loss	6,9 dB
Outside wall loss	10 dB
Slow fading deviation in indoors	6 dB
Slow fading deviation in outdoors	6 dB
Building size	110 x 110 meters
Street size	110 x 15 meters
Room size	22 x 25 meters
Number of rooms	5 rooms in 4 rows
Corridor size	110 x 5 meters
Number of corridors	2
Size of entrance point	5 meters
Number of base stations	4 .. 6
BS coordinates	tba

5.3 Minimum coupling loss (MCL)

Minimum Coupling Loss (MCL) is defined as the minimum distance loss including antenna gain measured between antenna connectors.

5.3.1 MCL for Local Area scenario

The minimum coupling loss between UEs is independent of the scenario, therefore the same minimum coupling loss is assumed for all environments.

Local area BSs are usually mounted under the ceiling, on wall or some other exposed position. In [4] chapter 4.1.1.2 a minimal separation of 2 metres between UE and indoor BS is assumed. Free space path loss is defined in [4] as:

$$\text{Path loss [dB]} = 38,25 + 20 \log10(d\ [m])$$

Taking into account 0 dBi antenna gain for Local area BS and UE and a body loss of 1 dB at the terminal, a MCL of 45,27 dB is obtained. The additional 2 dB cable loss at the BS as proposed in TR 25.942 is not considered.

The assumed MCL values are summarised in Table 5.2.

Table 5.2: Minimum Coupling Losses

	MCL
MS ↔ MS	40 dB
Local area BS ↔ MS	45 dB
Local area BS ↔ Local area BS	45 dB

5.4 Propagation conditions for local area base stations

The demodulation of DCH in multipath fading conditions in TS 25.105 considers three different test environments:

Case 1: Typical indoor environment delay spread, low terminal speed

Case 2: Large delay spread (12 µs), low terminal speed

Case 3: Typical vehicular environment delay spread, high terminal speed (120 km/h)

The local area BS is intended for small cells as can be usually found in indoor environments or outdoor hot spot areas. The large delay spread in Case 2 and the high terminal speed in Case 3 are not typical for these scenarios. Therefore, requirements defined for Case 2 and Case 3 shall not be applied to the local area BS. The Case 1 propagation condition shall apply for both the local area and wide area BS.

6 Base station classes

This section describes how the base station classes are defined.

6.1 Base station class criteria

Different sets of requirements are derived from calculations based on Minimum Coupling Loss between BS and UE. Each set of requirements corresponds to a base station class used as criteria for classification. Two classes are defined: Wide Area BS class and Local Area BS class.

Wide Area BS class assumes relatively high MCL, as is typically found in outdoor macro and outdoor micro environments, where the BS antennas are located off masts, roof tops or high above street level. Existing requirements are used, as they are in [1], for the Wide Area BS class. Requirements have been derived assuming 53 dB and 70 dB MCL for micro and macro scenarios, respectively.

Local Area BS class assumes relatively low MCL, as is typically found indoors (offices, subway stations etc) where antennas are located on the ceilings or walls or possibly built-in in the BS on the wall. Low-CL can also be found outdoors on hot spot areas like market place, high street or railway station. New requirements, as defined in this TR, are set for the Local Area BS class. Requirements have been derived assuming 40 dB MCL.

7 Changes with respect to Release 4

7.1 Changes in 25.105

This section describes the considered changes to requirements on BS minimum RF characteristics, with respect to Release 4 requirements in TS 25.105.

7.1.1 New text for base station classes

The requirements in this specification apply to both Wide Area Base Stations and Local Area Base Stations, unless otherwise stated.

Wide Area Base Stations are characterised by requirements based on BS to UE coupling losses equal to or higher than 53 dB.

Local Area Base Stations are characterised by requirements based on BS to UE coupling losses less than 53 dB.

7.1.2 Frequency stability

7.1.2.1 New requirement

In the present system, the mobile has to be designed to work with a Doppler shift caused by speeds up to 250 km/h at 2100 MHz. This corresponds to a frequency offset of:

[Doppler shift, Hz] = [UE velocity, m/s] * [Carrier frequency, Hz] / [speed of light, m/s]

= (250 * 1000/3600) * 2,1 * 10^9 / (3 *10^8) Hz

≈ 486 Hz

At present, the BS requirement is 0,05 ppm, corresponding to 105 Hz at 2100 MHz.

In this case, the mobile must be able to successfully decode signals with offset of:

[present UE decode offset, Hz] = [frequency error, Hz] + [max. Doppler shift, Hz]

= 486 Hz + 105 Hz

= 591 Hz

The frequency error requirement for local area BS class is proposed to be relaxed to 0,1 ppm.

[frequency error, ppm] = 0,1 ppm

This corresponds to a maximum UE speed of 155 km/h.

[max. new Doppler shift] = [present UE decode offset] - [frequency error, Hz]

= 591 Hz – 210 Hz

= 301 Hz

[UE velocity, km/h] = [speed of light, km/h] * [Doppler shift, Hz] / [Carrier frequency, Hz]

= (3 *10^8 * 301 * 3600) / (2,1 * 10^9 * 1000)

= 155 km/h

7.1.2.2 New text for frequency stability

The modulated carrier frequency is observed over a period of one power control group (timeslot). The frequency error shall be within the accuracy range given in Table 7.1.

Table 7.1: Frequency error minimum requirement

BS class	accuracy
Wide area BS	±0,05 ppm
Local area BS	±0,1 ppm

7.1.3 Adjacent Channel Leakage power Ratio (ACLR)

7.1.3.1 Derivation of ACLR requirements for Local Area BS

7.1.3.1.1 Overview

Three different ACLR requirements for the Local Area BS (1,28 Mcps TDD option) are considered in a similar way as for the Wide Area BS, to take due account of different deployment scenarios:

- a minimum requirement, which is based on BS to MS interference in case of synchronised TDD operation;
- additional requirements for operation in the same geographic area with FDD or unsynchronised TDD on adjacent channels;
- additional requirements in case of co-siting with unsynchronised TDD BS or FDD BS operating on an adjacent channel.

As was done for the Wide Area BS, it is proposed to define the minimum requirement also for the Local Area BS in a relative manner, i.e. as the ratio of the RRC filtered mean power centered on the assigned channel frequency to the RRC filtered mean power centered on an adjacent channel frequency (ACLR). For the additional requirements, it is proposed to state the requirements in an absolute manner, i.e. by defining the adjacent channel leakage power, which is the maximum allowed absolute emission level within the adjacent channel.

7.1.3.1.2 Minimum Requirement

The minimum requirement for ACLR is defined taking account of the BS to MS interference only, a scenario applying in case of synchronised TDD operation. BS to MS interference is dominated by the performance of the terminal (limited ACS). Therefore, it is proposed to use the same minimum requirement for the Local Area BS (1,28 Mcps TDD option) as defined for the Wide Area BS (1,28 Mcps TDD option).

7.1.3.1.3 Additional requirement for operation in the same geographic area with FDD or unsynchronised TDD on adjacent channels

Firstly, let us assume that a TDD Local Area BS is operated in the same geographic area with an unsynchronised TDD system operating on adjacent channels. Then, the TDD Local Area BS may generate adjacent channel leakage power which interferes with both MS and BS of the victim TDD system. The ACLR limits for the protection of the victim MS are already covered by the minimum ACLR requirement, see 7.1.3.1.2; therefore, only the ACLR requirement for the protection of the victim TDD BS needs further consideration.

Secondly, let us assume that a TDD Local Area BS is operated in the same geographic area with FDD on adjacent channels. Due to the given spectrum arrangement for TDD and FDD, and, in particular, due to the fact that the lower TDD band (1900 – 1920 MHz) and the receive band of the FDD BS (1920 – 1980 MHz) are contiguous without any explicit guard band, the TDD Local Area BS – if operated in the lower TDD band as indicated above - may generate adjacent channel leakage power which falls into the receive band of a FDD BS; therefore, an ACLR requirement for the protection of a FDD BS needs to be established.

In both cases considered above, the victim BS may be a Local Area BS or a Wide Area BS, so that a number of different interference scenarios exist. According to [4], it is assumed that the most critical scenario is given by situation that the TDD Local Area BS interferes with a Wide Area BS operated in a macro environment.

The derivation of ACLR requirements in the following subclauses makes use of the Minimum Coupling Loss between the TDD Local Area BS and the victim BS. As shown in [4], a MCL of 87 dB may be assumed in cases where the ACLR requirement applies and the carrier separation is 5 MHz or less.

7.1.3.1.3.1 Additional requirement for operation in the same geographic area with unsynchronised TDD on adjacent channels

The acceptable interference level of a possible victim TDD Wide Area BS (1,28 Mcps or 3,84 Mcps TDD option) is assumed to be –106 dBm, if the interference is time-continuous. If the interference is generated by a TDD BS operating on an adjacent channel, the interference tends to be non-continuous, and the victim TDD system can escape from this interference to a large extent via DCA (dynamic channel allocation). That means that TDD systems will synchronise themselves via DCA as far as possible. As a result, depending on the actual traffic demand of the interferer BS and the interfered-with BS for up- and downlink, only few timeslots may remain where the victim BS will be affected by adjacent channel interference. Even these timeslots might be usable for terminals located close to the BS. To take account of this effect, a 3 dB gain due to DCA is assumed for TDD-TDD interference. This leads to an acceptable interference level of a TDD Wide Area BS of –103 dBm.

Depending on the chip rate of the victim system, different adjacent channel offsets have to be considered. In case the victim system uses a chip rate of 1,28 Mcps, adjacent channel leakage power limits are defined for the first and second adjacent channel, corresponding to BS adjacent channel offsets of ±1,6 MHz and ±3,2 MHz. In case the victim system uses a chip rate of 3,84 Mcps, a BS adjacent channel offset of ±3,4 MHz is considered, taking into account the given channel raster of 200 kHz. Note that the adjacent channel leakage power at frequency offsets above ±4 MHz is limited by the spurious emissions requirements; therefore, additional BS adjacent channel offsets above ±4 MHz are not considered here.

As explained above in 7.1.3.1.3, a MCL of 87 dB may be assumed in cases where the ACLR requirement applies and the carrier separation is 5 MHz or less. As a result, the adjacent channel leakage power limit in all cases considered is given by

-103 dBm + 87 dB = -16 dBm.

Table 7.2 summarises the adjacent channel leakage power for geographic areas where only the 1,28 Mcps TDD option is deployed; Table 7.3 applies otherwise.

Table 7.2: Adjacent channel leakage power limits for operation in the same geographic area with unsynchronised 1.28 Mcps TDD on adjacent channels

BS Class	BS Adjacent Channel Offset	Maximum Level	Measurement Bandwidth
Local Area BS	± 1,6 MHz	-16 dBm	1,28 MHz
Local Area BS	± 3,2 MHz	-16 dBm	1,28 MHz

Table 7.3: Adjacent Channel leakage power limits for operation in the same geographic area with unsynchronised TDD on adjacent channels

BS Class	BS Adjacent Channel Offset	Maximum Level	Measurement Bandwidth
Local Area BS	± 3,4 MHz	-16 dBm	3,84 MHz

7.1.3.1.3.2 Additional requirement for operation in the same geographic area with FDD on adjacent channels

As mentioned above in 7.1.3.1.3.1, the adjacent channel leakage power at frequency offsets above ±4 MHz is limited by the spurious emissions requirements. Therefore, an additional ACLR requirement for operation in the same geographic area with FDD on adjacent channels is applicable only if the TDD Local Area BS is intended to operate in the frequency band 1900 MHz – 1920 MHz and its highest carrier frequency used is in the range 1916,2 MHz to 1920 MHz. Furthermore, only interference falling into the lowest FDD frequency channel of the total BS receive band 1920 MHz – 1980 MHz needs to be considered; i.e. the adjacent channel leakage power limit of the TDD Local Area BS needs to be specified at 1922,6 MHz only.

The acceptable interference level of a FDD Wide Area BS is assumed to be –110 dBm. With the MCL of 87 dB, see 7.1.3.1.3, the adjacent channel leakage power of the TDD Local Area BS is given by

-110 dBm + 87 dB = -23 dBm.

Table 7.4 summarises the requirements.

Table 7.4: Adjacent channel leakage power limits for operation in the same geographic area with FDD on adjacent channels

BS Class	Center Frequency for Measurement	Maximum Level	Measurement Bandwidth
Local Area BS	1922,6 MHz	-23 dBm	3,84 MHz

7.1.3.1.4 Additional requirement in case of co-siting with unsynchronised TDD BS or FDD BS operating on an adjacent channel

Different BS classes are defined to take into account unlike use scenarios and radio environments. Therefore, it is assumed that base stations of different classes will typically not be deployed at the same site, and co-siting of different base station classes is not considered.

However, a TDD Local Area BS may be co-sited with another TDD Local Area BS or a FDD Local Area BS. Both cases are considered in the following subclauses.

7.1.3.1.4.1 Additional requirement in case of co-siting with unsynchronised TDD BS operating on an adjacent channel

As explained above, only the co-siting with another (unsynchronised) TDD Local Area BS is considered here.

The victim TDD Local Area BS may operate in the 1,28 Mcps option or in the 3,84 Mcps option. Depending on the chip rate, different values of the acceptable interference level and of adjacent channel offsets have to be considered:

For continuous interference, the acceptable interference values of the TDD Local Area BS are assumed to be –82 dBm for the 1,28 Mcps option and –79 dBm for the 3,84 Mcps option. Due to desensitisation of the TDD Local Area BS, these values are significantly higher than those of the corresponding TDD Wide Area BS. For non-continuous interference, as generated by the TDD Local Area BS, a 3 dB gain due to DCA is taken into account; see 7.1.3.1.3.1; this leads to an acceptable interference level of –79 dBm for the 1,28 Mcps option and –76 dBm for the 3,84 Mcps option.

Values of the adjacent channel offset to be considered are derived in a similar way as in 7.1.3.1.3.1: In case the victim system uses a chip rate of 1,28 Mcps, adjacent channel leakage power limits are defined for the first and second adjacent channel, corresponding to BS adjacent channel offsets of ±1,6 MHz and ±3,2 MHz. In case the victim system uses a chip rate of 3,84 Mcps, a BS adjacent channel offset of ±3,4 MHz is considered.

As deduced in subclause 5.3.1 of this TR, a Minimum Coupling Loss between two Local Area BS of MCL=45 dB is assumed.

Based on the assumptions given above, the adjacent channel leakage power limits can be calculated. The results are shown in Table 7.5 for geographic areas where only the 1,28 Mcps TDD option is deployed; Table 7.6 applies otherwise.

Table 7.5: Adjacent channel leakage power limits in case of co-siting with unsynchronised 1.28 Mcps TDD on an adjacent channel

BS Class	BS Adjacent Channel Offset	Maximum Level	Measurement Bandwidth
Local Area BS	± 1,6 MHz	-34 dBm	1,28 MHz
Local Area BS	± 3,2 MHz	-34 dBm	1,28 MHz

Table 7.6: Adjacent Channel leakage power limits for operation in the same geographic area with unsynchronised TDD on an adjacent channel

BS Class	BS Adjacent Channel Offset	Maximum Level	Measurement Bandwidth
Local Area BS	± 3,4 MHz	-31 dBm	3,84 MHz

7.1.3.1.4.2 Additional requirement in case of co-siting with FDD BS operating on an adjacent channel

As explained above, only co-siting with an FDD Local Area BS is considered here. However, requirements for the FDD Local Area BS are not defined yet. Therefore, a co-location requirement for the TDD Local Area BS is intended to be part of a later release.

7.1.3.2 New text for Adjacent Channel Leakage power Ratio (ACLR)

NOTE: (NOT INTENDED TO BE INCLUDED IN 25.105)
The new text in 7.1.3.2 is based on TS 25.105 V4.4.0, considering only those subclauses which apply to the 1,28 Mcps TDD option. Although the text is intended to specify the Local Area BS, it also contains elements which are applicable to the TDD Wide Area BS and therefore are out of scope with respect to the present TR. However, it seems inconvenient and not practical to separate the text into two individual parts (one part for each BS class).

Adjacent Channel Leakage power Ratio (ACLR) is the ratio of the RRC filtered mean power centered on the assigned channel frequency to the RRC filtered mean power centered on an adjacent channel frequency. The requirements shall apply for all configurations of BS (single carrier or multi-carrier), and for all operating modes foreseen by the manufacturer's specification.

In some cases the requirement is expressed as adjacent channel leakage power, which is the maximum absolute emission level on the adjacent channel frequency measured with a filter that has a Root Raised Cosine (RRC) filter response with roll-off α=0.22 and a bandwidth equal to the chip rate of the victim system.

The requirement depends on the deployment scenario. Three different deployment scenarios have been defined as given below.

7.1.3.2.1 Minimum Requirement

For the 1,28 Mcps TDD option, the ACLR of a single carrier BS or a multi-carrier BS with contiguous carrier frequencies shall be higher than the value specified in Table 7.7.

Table 7.7: BS ACLR

BS adjacent channel offset below the first or above the last carrier frequency used	ACLR limit
1,6 MHz	40 dB
3,2 MHz	45 dB

If a BS provides multiple non-contiguous single carriers or multiple non-contiguous groups of contiguous single carriers, the above requirements shall be applied individually to the single carriers or group of single carriers.

7.1.3.2.2 Additional requirement for operation in the same geographic area with FDD or unsynchronised TDD on adjacent channels

7.1.3.2.2.1 Additional requirement for operation in the same geographic area with unsynchronised TDD on adjacent channels

In case the equipment is operated in the same geographic area with an unsynchronised TDD BS operating on an adjacent channel, the requirement is specified in terms of adjacent channel leakage power. In geographic areas where only UTRA 1,28 Mcps TDD option is deployed, the adjacent channel leakage power limits shall not exceed the limits specified in Table 7.8, otherwise the limits in Table 7.9 shall apply.

Table 7.8: Adjacent channel leakage power limits for operation in the same geographic area with unsynchronised 1.28 Mcps TDD on adjacent channels

BS Class	BS Adjacent Channel Offset	Maximum Level	Measurement Bandwidth
Wide Area BS	± 1,6 MHz	-29 dBm	1,28 MHz
Wide Area BS	± 3,2 MHz	-29 dBm	1,28 MHz
Local Area BS	± 1,6 MHz	-16 dBm	1,28 MHz
Local Area BS	± 3,2 MHz	-16 dBm	1,28 MHz

Table 7.9: Adjacent channel leakage power limits for operation in the same geographic area with unsynchronised TDD on adjacent channels

BS Class	BS Adjacent Channel Offset	Maximum Level	Measurement Bandwidth
Wide Area BS	± 3,4 MHz	-29 dBm	3,84 MHz
Local Area BS	± 3,4 MHz	-16 dBm	3,84 MHz

NOTE: The requirements in Table 7.8 and 7.9 for the Wide Area BS are based on a coupling loss of 74 dB between the unsynchronised TDD base stations. The requirements in Table 7.8 and 7.9 for the Local Area BS are based on a coupling loss of 87 dB between unsynchronised Wide Area and Local Area TDD base stations. The scenarios leading to these requirements are addressed in TR25.942 [4].

7.1.3.2.2.2 Additional requirement for operation in the same geographic area with FDD on adjacent channels

In case the equipment is operated in the same geographic area with a FDD BS operating on an adjacent channel, the adjacent channel leakage power shall not exceed the limits specified in Table 7.10. This requirement is only applicable if the equipment is intended to operate in frequency bands specified in 5.2 a) and the highest carrier frequency used is in the range 1916,2 – 1920 MHz.

Table 7.10: Adjacent channel leakage power limits for operation in the same geographic area with FDD on adjacent channels

BS Class	Center Frequency for Measurement	Maximum Level	Measurement Bandwidth
Wide Area BS	1922,6 MHz	-36 dBm	3,84 MHz
Local Area BS	1922,6 MHz	-23 dBm	3,84 MHz

NOTE: The requirement in Table 7.10 for Wide Area BS is based on a relaxed coupling loss of 74 dB between the TDD and FDD base stations. The requirement in Table 7.10 for Local Area BS is based on a relaxed coupling loss of 87 dB between TDD and FDD base stations. The scenarios leading to these requirements are addressed in TR 25.942 [4].

7.1.3.2.3 Additional requirement in case of co-siting with unsynchronised TDD BS or FDD BS operating on an adjacent channel

7.1.3.2.3.1 Additional requirement in case of co-siting with unsynchronised TDD BS operating on an adjacent channel

In case the equipment is co-sited to unsynchronised TDD BS operating on an adjacent frequency band, the requirement is specified in terms of adjacent channel leakage power. In geographic areas where only UTRA 1.28 Mcps TDD option is deployed, the adjacent channel leakage power shall not exceed the limits specified in Table 7.11, otherwise the limits in Table 7.12 shall apply.

Table 7.11: Adjacent channel leakage power limits in case of co-siting with unsynchronised 1.28 Mcps TDD on an adjacent channel

BS Class	BS Adjacent Channel Offset	Maximum Level	Measurement Bandwidth
Wide Area BS	± 1,6 MHz	-73 dBm	1,28 MHz
Wide Area BS	± 3,2 MHz	-73 dBm	1,28 MHz
Local Area BS	± 1,6 MHz	-34 dBm	1,28 MHz
Local Area BS	± 3,2 MHz	-34 dBm	1,28 MHz

Table 7.12: Adjacent Channel leakage power limits for operation in the same geographic area with unsynchronised TDD on an adjacent channel

BS Class	BS Adjacent Channel Offset	Maximum Level	Measurement Bandwidth
Wide Area BS	± 3,4 MHz	-73 dBm	3,84 MHz
Local Area BS	± 3,4 MHz	-31 dBm	3,84 MHz

NOTE: The requirements in Table 7.11 and 7.12 for the Wide Area BS are based on a minimum coupling loss of 30 dB between unsynchronised TDD base stations. The requirements in Table 7.11 and 7.12 for the Local Area BS are based on a minimum coupling loss of 45 dB between unsynchronised Local Area base stations. The co-location of different base station classes is not considered.

7.1.3.2.3.2 Additional requirement in case of co-siting with FDD BS operating on an adjacent channel

NOTE: The co-location of different base station classes is not considered. A co-location requirement for the Local Area TDD BS is intended to be part of a later release.

7.1.4 Reference sensitivity level

The reference sensitivity is the minimum receiver input power measured at the antenna connector at which the Bit Error Ratio (BER) does not exceed the specific value indicated in section 7.1.4.1.

7.1.4.1 Minimum Requirement

For the measurement channel specified in Annex A of TS 25.105, the reference sensitivity level and performance of the BS shall be as specified in table 7.13 below.

Table 7.13: BS reference sensitivity levels

BS class	Data rate	BS reference sensitivity level (dBm)	BER
Wide area BS	12,2 kbps	-110 dBm	BER shall not exceed 0,001
Local area BS	12,2 kbps	-96 dBm	BER shall not exceed 0,001

7.1.5 Adjacent Channel Selectivity (ACS)

Adjacent channel selectivity (ACS) is a measure of the receiver ability to receive a wanted signal at its assigned channel frequency in the presence of an adjacent channel signal at a given frequency offset from the center frequency of the assigned channel. ACS is the ratio of the receiver filter attenuation on the assigned channel frequency to the receive filter attenuation on the adjacent channel(s).

7.1.5.1 Minimum Requirement

The BER shall not exceed 0,001 for the parameters specified in table 7.14.

Table 7.14 : Adjacent channel selectivity

Parameter		Level	Unit
Data rate		12,2	kbps
Wanted signal		Reference sensitivity level + 6dB	dBm
Interfering signal	Wide area BS	-55	dBm
	Local area BS	-41	dBm
Fuw (Modulated)		1,6	MHz

7.1.6 Blocking and Intermodulation Characteristics

7.1.6.1 Blocking characteristics

The blocking characteristics is a measure of the receiver ability to receive a wanted signal at its assigned channel frequency in the presence of an unwanted interferer on frequencies other than those of the adjacent channels. The blocking performance requirement applies to interfering signals with center frequency within the ranges specified in the tables below, using a 1 MHz step size.

7.1.6.1.0 Minimum requirement

The static reference performance as specified in clause 7.2.1 shall be met with a wanted and an interfering signal coupled to the BS antenna input using the following parameters.

Table 7.15(a): Blocking requirements for operating bands defined in 5.2(a)

Center Frequency of Interfering Signal	Interfering Signal Level	Wanted Signal Level	Minimum Offset of Interfering Signal	Type of Interfering Signal
1900 – 1920 MHz, 2010 – 2025 MHz	-30 dBm	<REFSENS> + 6 dB	3.2MHz	Narrow band CDMA signal with one code
1880 – 1900 MHz, 1990 – 2010 MHz, 2025 – 2045 MHz	-30dBm	<REFSENS> + 6 dB	3.2MHz	Narrow band CDMA signal with one code
1920 – 1980 MHz	-30dBm	<REFSENS> + 6 dB	3.2MHz	Narrow band CDMA signal with one code
1 – 1880 MHz, 1980 – 1990 MHz, 2045 – 12750 MHz	-15dBm	<REFSENS> + 6 dB	—	CW carrier

Table 7.15(b): Blocking requirements for operating bands defined in 5.2(b)

Center Frequency of Interfering Signal	Interfering Signal Level	Wanted Signal Level	Minimum Offset of Interfering Signal	Type of Interfering Signal
1850 – 1990 MHz	-30dBm	<REFSENS> + 6 dB	3.2MHz	Narrow band CDMA signal with one code
1830 – 1850 MHz, 1990 – 2010 MHz	-30 dBm	<REFSENS> + 6 dB	3.2MHz	Narrow band CDMA signal with one code
1 – 1830 MHz, 2010 – 12750 MHz	-15 dBm	<REFSENS> + 6 dB	—	CW carrier

Table 7.15(c): Blocking requirements for operating bands defined in 5.2(c)

Center Frequency of Interfering Signal	Interfering Signal Level	Wanted Signal Level	Minimum Offset of Interfering Signal	Type of Interfering Signal
1910 – 1930 MHz	-30dBm	<REFSENS> + 6 dB	3.2MHz	Narrow band CDMA signal with one code
1890 – 1910 MHz, 1930 – 1950 MHz	-30dBm	<REFSENS> + 6 dB	3.2 MHz	Narrow band CDMA signal with one code
1 – 1890 MHz, 1950 – 12750 MHz	-15 dBm	<REFSENS> + 6 dB	—	CW carrier

7.1.6.2 Intermodulation characteristics

Third and higher order mixing of the two interfering RF signals can produce an interfering signal in the band of the desired channel. Intermodulation response rejection is a measure of the capability of the receiver to receiver a wanted signal on its assigned channel frequency in the presence of two or more interfering signals which have a specific frequency relationship to the wanted signal.

7.1.6.2.1 Minimum requirement

The static reference performance as specified in clause 7.2.1 should be met when the following signals are coupled to BS antenna input.

- A wanted signal at the assigned channel frequency, 6 dB above the static reference level.
- Two interfering signals with the following parameters.

Table 7.16: Intermodulation requirement

Interfering Signal Level	Offset	Type of Interfering Signal
- 38 dBm	3,2 MHz	CW signal
- 38 dBm	6,4 MHz	1,28 Mcps TDD Option signal with one code

7.1.7 Demodulation in static propagation conditions

7.1.7.1 Demodulation of DCH

The performance requirement of DCH in static propagation conditions is determined by the maximum Block Error Rate (BLER) allowed when the receiver input signal is at a specified $\hat{I}_{or}/I_{oc}$ limit. The BLER is calculated for each of the measurement channels supported by the base station.

This performance requirement shall be applied to both Wide Area BS and Local Area BS.

7.1.7.1.1 Minimum requirement

For the parameters specified in Table 7.17 for the Wide Area BS and the Local Area BS, respectively, the BLER should not exceed the piece-wise linear BLER curve specified in Table 7.18. These requirements are applicable for TFCS size 16.

Table 7.17: Parameters in static propagation conditions

Parameters		Unit	Test 1	Test 2	Test 3	Test 4
Number of $DPCH_o$			4	1	1	0
Spread factor of $DPCH_o$			8	8	8	-
$\frac{DPCH_o\_E_c}{I_{or}}$		dB	-7	-7	-7	0
I_{oc}	Wide Area BS	DBm/1,28MHz	-91			
	Local Area BS	DBm/1,28MHz	-77			
Information Data Rate		kbps	12,2	64	144	384

Table 7.18: Performance requirements in AWGN channel.

Test Number	$\frac{\hat{I}_{or}}{I_{oc}}$ [dB]	BLER Required E_b/N_0
1	0.6	10^{-2}
2	-0.9	10^{-1}
	-0.4	10^{-2}
3	-0.3	10^{-1}
	-0.1	10^{-2}
4	0.5	10^{-1}
	0.6	10^{-2}

7.1.8 Demodulation of DCH in multipath fading conditions

7.1.8.1 Multipath fading Case 1

The performance requirement of DCH in multipath fading Case 1 is determined by the maximum Block Error Rate (BLER) allowed when the receiver input signal is at a specified $\hat{I}_{or}/I_{oc}$ limit. The BLER is calculated for each of the measurement channels supported by the base station.

This performance requirement shall be applied to both Wide Area BS and Local Area BS.

7.1.8.1.1 Minimum requirement

For the parameters specified in Table 7.19 for the Wide Area BS and the Local Area BS, respectively, the BLER should not exceed the piece-wise linear BLER curve specified in Table 7.20. These requirements are applicable for TFCS size 16.

Table 7.19: Parameters in multipath Case 1 channel

Parameters		Unit	Test 1	Test 2	Test 3	Test 4
Number of $DPCH_o$			4	1	1	0
Spread factor of $DPCH_o$			8	8	8	-
$\frac{DPCH_o\_E_c}{I_{or}}$		DB	-7	-7	-7	0
I_{oc}	Wide Area BS	dBm/1,28 MHz	-91			
	Local Area BS	dBm/1,28 MHz	-77			
Information Data Rate		kbps	12,2	64	144	384

Table 7.20: Performance requirements in multipath Case 1 channel.

Test Number	$\frac{\hat{I}_{or}}{I_{oc}}$ [dB]	BLER
1	10,4	10^{-2}
2	5,3	10^{-1}
	9,4	10^{-2}
3	5,7	10^{-1}
	10,1	10^{-2}
4	6,0	10^{-1}
	10,0	10^{-2}

7.1.8.2 Multipath fading Case 2

The performance requirement of DCH in multipath fading Case 2 is determined by the maximum Block Error Rate (BLER) allowed when the receiver input signal is at a specified $\hat{I}_{or}/I_{oc}$ limit. The BLER is calculated for each of the measurement channels supported by the base station.

This performance requirement shall not be applied to Local Area BS.

7.1.8.3 Multipath fading Case 3

The performance requirement of DCH in multipath fading Case 3 is determined by the maximum Block Error Rate (BLER) allowed when the receiver input signal is at a specified $\hat{I}_{or}/I_{oc}$ limit. The BLER is calculated for each of the measurement channels supported by the base station.

This performance requirement shall not be applied to Local Area BS.

7.1.9 Receiver dynamic range

Receiver dynamic range is the receiver ability to handle a rise of interference in the reception frequency channel. The receiver shall fulfil a specified BER requirement for a specified sensitivity degradation of the wanted signal in the presence of an interfering AWGN signal in the same reception frequency channel.

7.1.9.1 Minimum requirement

The BER shall not exceed 0,001 for the parameters specified in Table7.21

Table 7.21: Dynamic Range

Parameter		Level	Unit
Data rate		12.2	kbps
Wanted signal		<REFSENS> + 30 dB	dBm
Interfering AWGN signal	Wide Area BS	-76	dBm/1.28 MHz
	Local Area BS	-62	dBm/1.28 MHz

7.1.10 Transmitter spurious emissions

7.1.10.1 Derivation of transmitter spurious emissions requirements for Local Area BS

For the BS intended for general-purpose applications – the only BS class defined up to now-, 3GPP has specified mandatory transmitter spurious emissions requirements of Category A or Category B. These mandatory requirements are aligned with relevant ITU-R recommendations and are accepted as generally applicable; therefore, it is proposed to adopt them independent of the BS class considered.

Furthermore, 3GPP has specified additional requirements which may be applied for the protection of other systems in specific interference scenarios. Three scenarios are looked at:

- Co-existence with GSM 900
- Co-existence with DCS 1800
- Co-existence with UTRA FDD

Similar as the mandatory requirements, also the additional requirements for co-existence with GSM 900 and DCS 1800 are assumed to be independent of the BS class under consideration.

Special considerations are however necessary when examining the co-existence of the TDD Local Area BS with FDD. The TDD Local Area BS generates spurious emissions which may fall into the receive band of the FDD UE or into the receive band of the FDD BS. With respect to the spurious emissions falling into the receive band of the FDD UE, it is proposed that the same limits apply independent of the BS class. However, a different approach may be needed with respect to the spurious emissions requirements within the receive band of the FDD BS: Due to the given spectrum arrangement for TDD and FDD, see also the considerations in 7.1.5.1.2 with respect to ACLR, it may be required to define specific spurious emissions limits for the TDD Local Area BS to protect the FDD BS. Two cases will be considered:

- Operation of TDD Local Area BS and FDD BS in the same geographic area; see 7.1.10.1.1.
- Co-location of TDD Local Area BS and FDD BS; see 7.1.10.1.2.

7.1.10.1.1 Operation of TDD Local Area BS and FDD BS in the same geographic area

Let us assume that a TDD Local Area BS is operated in the same geographic area with FDD BS (Local Area or Wide Area). Then, as shown in [4] and already used for the derivation of additional ACLR requirements in 7.1.3.1.2, it may be concluded that the most critical interference scenario is given by the situation that the TDD Local Area BS interferes with a FDD Wide Area BS operated in a macro environment.

The Local Area BS may be seen as similar to a mobile station with respect to output power, antenna gain and antenna height. Therefore, it seems reasonable to assume that the MCL for the most critical interference scenario mentioned above is the same as between a mobile station and a Wide Area BS operated in a macro environment. According to [4], a MCL of 70 dB is appropriate for this case.

Assuming a maximum allowed interference level of the FDD Wide Area BS of –110 dBm, the required spurious emissions limit within the receive band of a FDD BS can be calculated as

-110 dBm + 70 dB = -40 dBm.

Because the spurious emissions limit given above is derived from the maximum allowed interference level within receiver bandwidth of the FDD Wide Area BS, the measurement bandwidth should be equal to 3,84 MHz.

7.1.10.1.2 Co-location of TDD Local Area BS and FDD BS

Different BS classes are defined to take into account unlike use scenarios and radio environments. Therefore, it is assumed that base stations of different classes will typically not be deployed at the same location, and co-location of different base station classes is not considered.

However, a TDD Local Area BS may be co-located with an FDD Local Area BS. Requirements for the FDD Local Area BS are not defined yet. Therefore, a co-location requirement for the TDD Local Area BS is intended to be part of a later release.

7.1.10.2 New text for transmitter spurious emissions

NOTE: (NOT INTENDED TO BE INCLUDED IN 25.105)
The new text in 7.1.10.2 is based on TS 25.105 V4.4.0. Although the text is intended to specify the Local Area BS (1,28 Mcps TDD option), it also contains elements which are applicable to the TDD Wide Area BS (1,28 Mcps TDD option) and to the BS of the 3,84 Mcps TDD option; these elements are out of scope with respect to the present TR. However, it seems inconvenient and not practical to separate the text into a part exclusively applicable to the Local Area BS (1,28 Mcps TDD option).

7.1.10.2.1 Co-existence with UTRA-FDD

7.1.10.2.1.1 Operation in the same geographic area

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

7.1.10.2.1.1.1 Minimum Requirement

For TDD base stations which use carrier frequencies within the band 2010 – 2025 MHz the requirements applies at all frequencies within the specified frequency bands in table 7.22. For 3,84 Mcps TDD option base stations which use a carrier frequency within the band 1900-1920 MHz, the requirement applies at frequencies within the specified frequency range which are more than 12,5 MHz above the last carrier used in the frequency band 1900-1920 MHz. For 1,28 Mcps TDD option base stations which use carrier frequencies within the band 1900-1920 MHz, the requirement applies at frequencies within the specified frequency range which are more than 4 MHz above the last carrier used in the frequency band 1900-1920 MHz.

The power of any spurious emission shall not exceed:

Table 7.22: BS Spurious emissions limits for BS in geographic coverage area of UTRA-FDD

BS Class	Band	Maximum Level	Measurement Bandwidth	Note
Wide Area BS	1920 – 1980 MHz	-43 dBm	3,84 MHz	
Wide Area BS	2110 – 2170 MHz	-52 dBm	1 MHz	
Local Area BS	1920 – 1980 MHz	-40 dBm	3,84 MHz	
Local Area BS	2110 – 2170 MHz	-52 dBm	1 MHz	

(*) For 3,84 Mcps TDD option base stations, the requirement shall be measured with the lowest center frequency of measurement at 1922,6 MHz or 15 MHz above the last TDD carrier used, whichever is higher. For 1,28 Mcps TDD option base stations, the requirement shall be measured with the lowest center frequency of measurement at 1922,6 MHz or 6,6 MHz above the last TDD carrier used, whichever is higher.

NOTE: The requirements for Wide Area BS in Table 7.22 are based on a coupling loss of 67 dB between the TDD and FDD base stations. The requirements for Local Area BS in Table 7.22 are based on a coupling loss of 70 dB between TDD and FDD Wide Area base stations. The scenarios leading to these requirements are addressed in TR 25.942 [4].

7.1.10.2.1.2 Co-located base stations

NOTE: The co-location of different base station classes is not considered. A co-location requirement for the TDD Local Area BS is intended to be part of a later release.

7.2 Changes in 25.123

7.2.1 New text for performance for UTRAN measurements in uplink (Rx)

7.2.1.1 RSCP

The measurement period shall be 100 ms.

7.2.1.1.1 Absolute accuracy requirements

Table 7.23: RSCP absolute accuracy

Parameter	Unit	Accuracy [dB]		Conditions	BS class
		Normal conditions	Extreme conditions	Io [dBm]	
RSCP	dB	± 6	± 9	-105..-74	Wide Area BS
RSCP	dB	± 6	± 9	-91..-60	Local Area BS

7.2.1.1.2 Relative accuracy requirements

The relative accuracy of RSCP in inter frequency case is defined as the RSCP measured from one UE compared to the RSCP measured from another UE.

Table 7.24: RSCP relative accuracy

Parameter	Unit	Accuracy [dB]	Conditions	BS class
			Io [dBm]	
RSCP	dB	± 3 for intra-frequency	-105..-74	Wide Area BS
RSCP	dB	± 3 for intra-frequency	-91..-60	Local Area BS

7.2.1.1.3 Range/mapping

The reporting range for *RSCP* is from -120 ...-57 dBm.

In table 7.25 mapping of the measured quantity is defined. Signalling range may be larger than the guaranteed accuracy range.

Table 7.25

Reported value	Measured quantity value	Unit
RSCP_LEV _00	RSCP <–120,0	dBm
RSCP_LEV _01	-120,0 ≤ RSCP < –119,5	dBm
RSCP_LEV _02	-119,5 ≤ RSCP < –119,0	dBm
…	…	…
RSCP_LEV _125	-58,0 ≤ RSCP < -57,5	dBm
RSCP_LEV _126	-57,5 ≤ RSCP < -57,0	dBm
RSCP_LEV _127	-57,0 ≤ RSCP	dBm

7.2.1.2 Timeslot ISCP

The measurement period shall be 100 ms.

7.2.1.2.1 Absolute accuracy requirements

Table 7.26: Timeslot ISCP Intra frequency absolute accuracy

Parameter	Unit	Accuracy [dB]		Conditions	BS class
		Normal conditions	Extreme conditions	Io [dBm]	
Timeslot ISCP	dB	± 6	± 9	-105..-74	Wide Area BS
Timeslot ISCP	dB	± 6	± 9	-91..-60	Local Area BS

7.2.1.2.2 Range/mapping

The reporting range for *Timeslot ISCP* is from -120...-57 dBm.

In table 7.27 mapping of the measured quantity is defined. Signalling range may be larger than the guaranteed accuracy range.

Table 7.27

Reported value	Measured quantity value	Unit
UTRAN_TS_ISCP_LEV_00	Timeslot_ISCP < –120,0	dBm
UTRAN_TS_ISCP_LEV_01	-120,0 ≤ Timeslot_ISCP < –119,5	dBm
UTRAN_TS_ISCP_LEV_02	-119,5 ≤ Timeslot_ISCP < –119,0	dBm
…	…	…
UTRAN_TS_ISCP_LEV_125	-58,0 ≤ Timeslot_ISCP < -57,5	dBm
UTRAN_TS_ISCP_LEV_126	-57,5 ≤ Timeslot_ISCP < -57,0	dBm
UTRAN_TS_ISCP_LEV_127	-57,0 ≤ Timeslot_ISCP	dBm

7.2.1.3 Received total wide band power

The measurement period shall be 100 ms.

7.2.1.3.1 Absolute accuracy requirements

Table 7.28: RECEIVED TOTAL WIDE BAND POWER Intra frequency absolute accuracy

Parameter	Unit	Accuracy [dB]	Conditions	BS class
			Io [dBm]	
RECEIVED TOTAL WIDE BAND POWER	dB	± 4	-105..-74	Wide Area BS
RECEIVED TOTAL WIDE BAND POWER	dB	± 4	-91..-60	Local Area BS

7.2.1.3.2 Range/mapping

The reporting range for *RECEIVED TOTAL WIDE BAND POWER* is from -112 ... -50 dBm.

In table 7.29 mapping of the measured quantity is defined. Signalling range may be larger than the guaranteed accuracy range.

Table 7.29

Reported value	Measured quantity value	Unit
RECEIVED TOTAL WIDE BAND POWER_LEV _000	RECEIVED TOTAL WIDE BAND POWER < –112,0	dBm
RECEIVED TOTAL WIDE BAND POWER_LEV _001	-112,0 ≤ RECEIVED TOTAL WIDE BAND POWER < –111,9	dBm
RECEIVED TOTAL WIDE BAND POWER_LEV _002	-111,9 ≤ RECEIVED TOTAL WIDE BAND POWER < –111,8	dBm
…	…	…
RECEIVED TOTAL WIDE BAND POWER_LEV _619	-50,2 ≤ RECEIVED TOTAL WIDE BAND POWER < -50,1	dBm
RECEIVED TOTAL WIDE BAND POWER_LEV _620	-50,1 ≤ RECEIVED TOTAL WIDE BAND POWER < -50,0	dBm
RECEIVED TOTAL WIDE BAND POWER_LEV _621	-50,0 ≤ RECEIVED TOTAL WIDE BAND POWER	dBm

7.3 Changes in 25.142

All changes of parameter values in 25.105 that are necessary to cover the requirements of the Local Area BS have to be reflected in TS 25.142 also. These changes, however, have already been reported in subclause 7.1 of this TR and are not repeated here. The present subclause lists only those changes to 25.142 which are related to conformance test procedures or are otherwise specific to conformance testing.

8 Impacts on other WGs

8.1 WG 1

none identified.

8.2 WG 2

none identified.

8.3 WG 3

none identified.

9 Backward compatibility

no issues identified.

Annex A: Change history

Change history							
Date	TSG #	TSG Doc.	CR	Rev	Subject/Comment	Old	New