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Evolved Universal Terrestrial Radio Access (E-UTRA) medium range and Multi-Standard Radio (MSR) medium range / local area Base Station (BS) class requirements
(Release 11)

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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:

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where:

x the first digit:

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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 the Technical Report for the Work Item on E-UTRA medium range and MSR medium range/local area BS class requirements.

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 TR 21.905: "Vocabulary for 3GPP Specifications".

[2] 3GPP TS 25.104: "Base Station (BS) radio transmission and reception (FDD)".

[3] 3GPP TS 36.104: "Evolved Universal Terrestrial Radio Access (E-UTRA); Base Station (BS) radio transmission and reception".

[4] 3GPP TS 37.104: "E-UTRA, UTRA and GSM/EDGE; Multi-Standard Radio (MSR) Base Station (BS) radio transmission and reception".

[5] 3GPP TR 25.942: "Radio Frequency (RF) system scenarios".

[6] 3GPP TR 25.951: "FDD Base Station (BS) classification".

[7] 3GPP TR 36.942: "Evolved Universal Terrestrial Radio Access (E-UTRA); Radio Frequency (RF) system scenarios".

[8] 3GPP TR 36.931: "Evolved Universal Terrestrial Radio Access (E-UTRA); Radio Frequency (RF) requirements for LTE Pico Node B".

[9] CEPT/ERC/Recommendation 74-01 (Siófok 98, Nice 99, Sesimbra 02, Hradec Kralove 05, Cardiff 11), "Unwanted Emissions in the Spurious Domain

[10] 3GPP TS 45.005: "Radio transmission and reception".

[11] 3GPP TS 51.021: "Base Station System (BSS) equipment specification; Radio aspects".

[12] 3GPP TR 37.900: "Radio Frequency (RF) requirements for Multicarrier and Multiple Radio Access Technology (Multi-RAT) Base Station (BS)"

3 Definitions, symbols and abbreviations

3.1 Definitions

For the purposes of the present document, the terms and definitions given in 3GPP TR 21.905 [1] and the following apply. A term defined in the present document takes precedence over the definition of the same term, if any, in 3GPP TR 21.905 [1].

Local Area Base Station: Base station are characterised by requirements derived from Pico Cell scenarios with a BS to UE minimum coupling loss equals to 45 dB.

Medium Range Base Station: Base station characterised by requirements derived from Micro Cell scenarios with a BS to UE minimum coupling loss equals to 53 dB.

Wide Area Base Station: Base station are characterised by requirements derived from Macro Cell scenarios with a BS to UE minimum coupling loss equals to 70 dB.

NOTE: The Wide Area Base Station class has the same requirements as the base station for General Purpose application in Release 99, 4 and 5 for UTRA BS, Release 8 for E-UTRA BS and Release 9 and 10 for MSR BS.

3.2 Symbols

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

B	Receiver nose bandwidth
NF	Noise Figure
N_{Thermal}	Thermal noise level at the receiver

3.3 Abbreviations

For the purposes of the present document, the abbreviations given in 3GPP TR 21.905 [1] and the following apply. An abbreviation defined in the present document takes precedence over the definition of the same abbreviation, if any, in 3GPP TR 21.905 [1].

ACIR	Adjacent Channel Interference Ration
ACLR	Adjacent Channel Leakage Ration
ACS	Adjacent Channel Selectivity
CACLR	Cumulative Adjacent Channel Leakage Ration
FRC	Fixed Reference Channel
ICS	In-Channel Selectivity
LA	Local Area
MR	Medium Range
PCx	Power Control Set x
ppm	Parts per million
SEM	Spectrum Emissions Mask
UEM	Unwanted Emissions Mask
WA	Wide Area

4 General

4.1 Work item objective

The objective of the work item is to specify the RF requirements for E-UTRA medium range and MSR medium range and local area BS classes.

The work will focus on the following steps:

1. Investigation of the possibility to re-use existing work in RAN4 related to BS classes (see 2.2).

2. Creation of new core requirements for E-UTRA medium range BS class for FDD and TDD.

3. Creation of new core requirements for MSR medium range and local area BS classes, covering BC1 (UTRA + E-UTRA) and BC2 (GSM+UTRA + E-UTRA) requirements.

4. Development of test requirements corresponding to new core requirements for the added BS classes.

The following specification work is required:

a. Core requirements for RAN4 E-UTRA and MSR specifications based on MSR principles and the RAT specific requirements.

b. Test requirements for RAN4 E-UTRA and MSR specifications, derived from the core requirements.

5 Re-use of existing RAN4 work on BS classes

Simulation parameters and assumptions used in the present work are partly re-used from previous studies of Medium range and Local Area BS classes in 3GPP TR 25.942 [5], 3GPP TR 25.951 [6], 3GPP TR 36.942 [7] and 3GPP TR 36.931 [8], as outlined in clause 6.

6 RF scenarios for the BS classes

6.1 Base station class definitions

For both UTRA and E-UTRA, the BS classes are defined based on the RF scenarios expected for the BS deployment, defined in terms of the Minimum Coupling Loss (MCL) between BS and UE. The following definitions are used 3GPP TS 25.104 [2] and 3GPP TS 36.104 [3]:

- **Wide Area (WA) Base Stations** are characterised by requirements derived from Macro Cell scenarios with a BS to UE minimum coupling loss equals to 70 dB. The Wide Area Base Station class has the same requirements as the base station for General Purpose application in Release 99, 4 and 5 for UTRA BS, Release 8 for E-UTRA BS and Release 9 and 10 for MSR BS.

- **Medium Range (MR) Base Stations** are characterised by requirements derived from Micro Cell scenarios with a BS to UE minimum coupling loss equals to 53 dB.

- **Local Area (LA) Base Stations** are characterised by requirements derived from Pico Cell scenarios with a BS to UE minimum coupling loss equals to 45 dB.

In order to align with previous work and to allow for harmonized MSR BS definitions, the same BS class definitions should be re-used for E-UTRA BS (medium range) and MSR BS (medium range and local area)

New BS classes are introduced in the GSM/EDGE specifications 3GPP TS 45.005 [10] and 3GPP TS 51.021 [11], where Wide Area multicarrier BTS, Medium Range multicarrier BTS and Local Area multicarrier BTS are defined. For GSM/EDGE operation of an MSR BS, the applicable multicarrier BTS class will apply.

6.2 Co-existence simulation cases

The cases in Table 6.2-.1 are identified for co-existence simulations. Further simulation parameters are identified in subclause 6.3 and the simulation results are summarized in Annex C.

Table 6.2-1: Overview of simulation cases

Case	Aggressor	Victim	Simulated link	Network Layout	Statistics	Target RF requirement
E1a	E-UTRA Micro	E-UTRA Micro	Uplink	Micro + micro (Figure 6.3.1.2-6)	Throughput loss	Reference sensitivity
E1b-1	E-UTRA Micro	E-UTRA Macro	Uplink	Micro + Macro (ISD = 500 m) (Figure 6.3.1.2-3)	Throughput loss	Reference sensitivity
E1b-2	E-UTRA Micro	E-UTRA Macro	Uplink	Micro + Macro (ISD = 1723 m) (Figure 6.3.1.2-4)	Throughput loss	Reference sensitivity
E2a	E-UTRA Micro	E-UTRA Micro	Uplink	Micro + micro (Figure 6.3.1.2-6)	Interferer levels at victim BS	In-band blocking
E2b-1	E-UTRA Macro	E-UTRA Micro	Uplink	Micro + Macro (ISD = 500 m) (Figure 6.3.1.2-3)	Interferer levels at victim BS	In-band blocking
E2b-2	E-UTRA Macro	E-UTRA Micro	Uplink	Micro + Macro (ISD = 1723 m) (Figure 6.3.1.2-4)	Interferer levels at victim BS	In-band blocking
U1a	E-UTRA Micro	UTRA Micro	Uplink	Micro + micro (Figure 6.3.1.2-6)	Capacity loss	Reference sensitivity
U1b-1	E-UTRA Micro	UTRA Macro	Uplink	Micro + Macro (ISD = 500 m) (Figure 6.3.1.2-3)	Capacity loss	Reference sensitivity
U1b-2	E-UTRA Micro	UTRA Macro	Uplink	Micro + Macro (ISD = 1723 m) (Figure 6.3.1.2-4)	Capacity loss	Reference sensitivity

6.3 Co-existence simulation parameters

6.3.1 Network layouts

6.3.1.1 Macro network layout

The macro cell network is a tri-sector layout consisting of 57 cells with base stations located at 19 sites as shown in Figure 6.3.1.1-1. The layout is taken from TR 25.942 3GPP [5], Figure 4.4. The ISD is 500m or 1732 m.

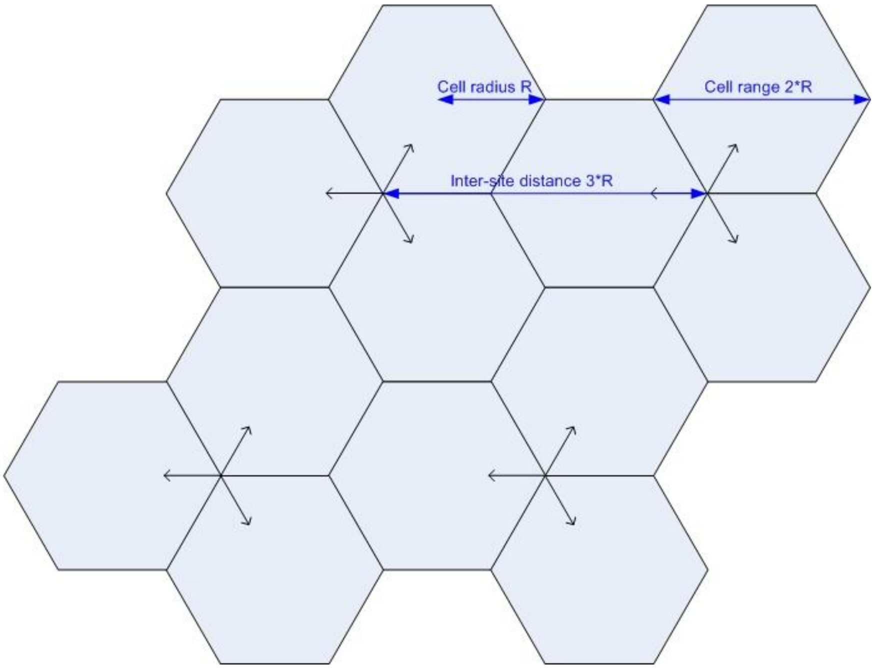

Figure 6.3.1.1-1: Macro cell tri-sector layout from Figure 4.4 of 3GPP TR36.942 [7]

6.3.1.2 Micro network layouts

A modified version of the Manhattan grid pattern from 3GPP TR 25.942 [5] (Figure 4.8) is used as a micro cell layout. The proposed modification produces a symmetrical grid pattern that can be replicated into a larger grid. An additional column with 3 new nodes has been added resulting in a 12 by 12 block grid, as shown in Figure 6.3.1.2-1.

In addition, 3 nodes on the top of the grid have been removed since they are redundant with the nodes on the bottom of the original grid when wrap-around is employed. As per the Manhattan grid definition in 3GPP TR 25.942 [5], each block is 75m x 75m and each street is 15m wide. This results in the modified grid having a dimension of 1080m x 1080m.

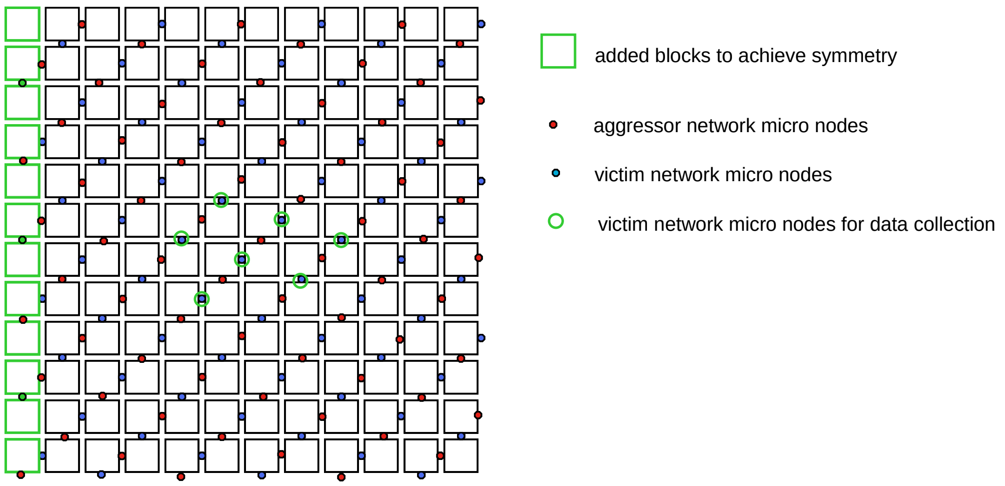

Figure 6.3.1.2-1: Micro cellular Manhattan grid pattern (modified version of the 3GPP TR 25.942 [5] grid).

To ensure that at least one macro cell is covered when the micro cells are overlaid on the larger macro cell layout with ISD 1732 m, a larger Manhattan is grid used, formed by a four-fold replication of the Manhattan grid in Figure 6.3.1.2-1. This extended grid is shown below in Figure 6.3.1.2-2.

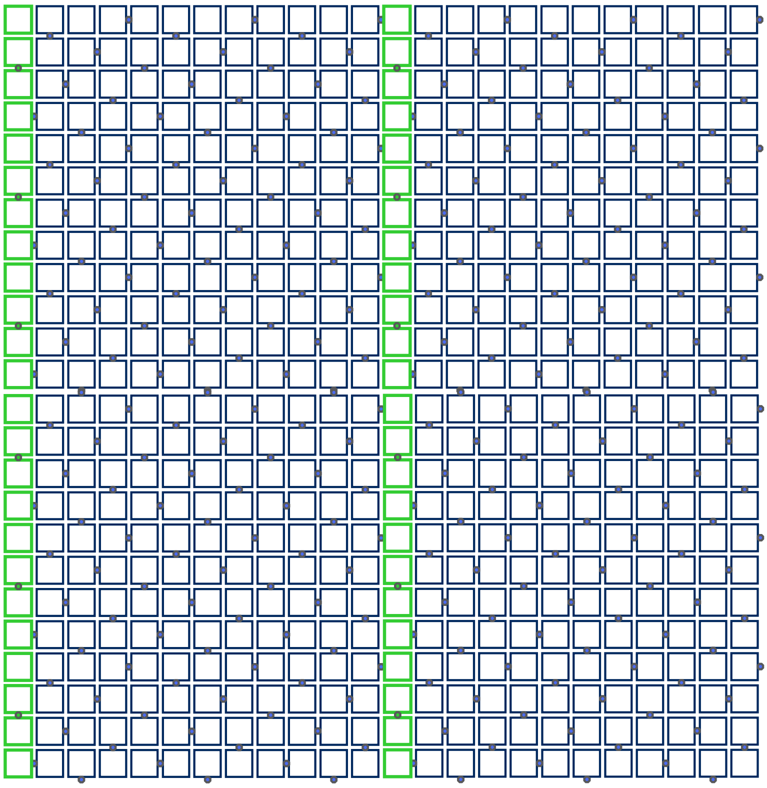

Figure 6.3.1.2-2: Four-fold replication of modified grid pattern of Figure 6.3.1.2-1 above.

For micro-to-macro and macro-to-micro simulations, the following layouts are used for the overlaid patterns:

- In case of an ISD of 500 m for the macro network, the layout of Figure 6.3.1.2-3 is used, with the 12 column micro grid pattern centred over the corner between cell#3/19/20 of the macro network.
- In case of an ISD of 1732 m for the macro network, the layout of Figure 6.3.1.2-4 is used, with the extended (four-fold) micro grid pattern centred over the corner between cell#3/19/20 of the macro network.

For these simulations, in the area that is overlapped by the Micro network's Manhattan grid, UEs should only be dropped in the streets. In order to maintain the same Macro UE density per cell as in the area not covered by the Micro network, the following principle should be used:

1. Macro UEs are first dropped with a uniform distribution over the whole Macro grid area, both in the part not covered by the micro network and in the part that is overlapped by the micro network.
2. In the area overlapping with the micro network, UEs that were dropped indoor are identified. These UEs are then dropped again, uniformly over the outdoor "half-street" area surrounding the indoor block, as shown in Figure 6.3.1.2-5.

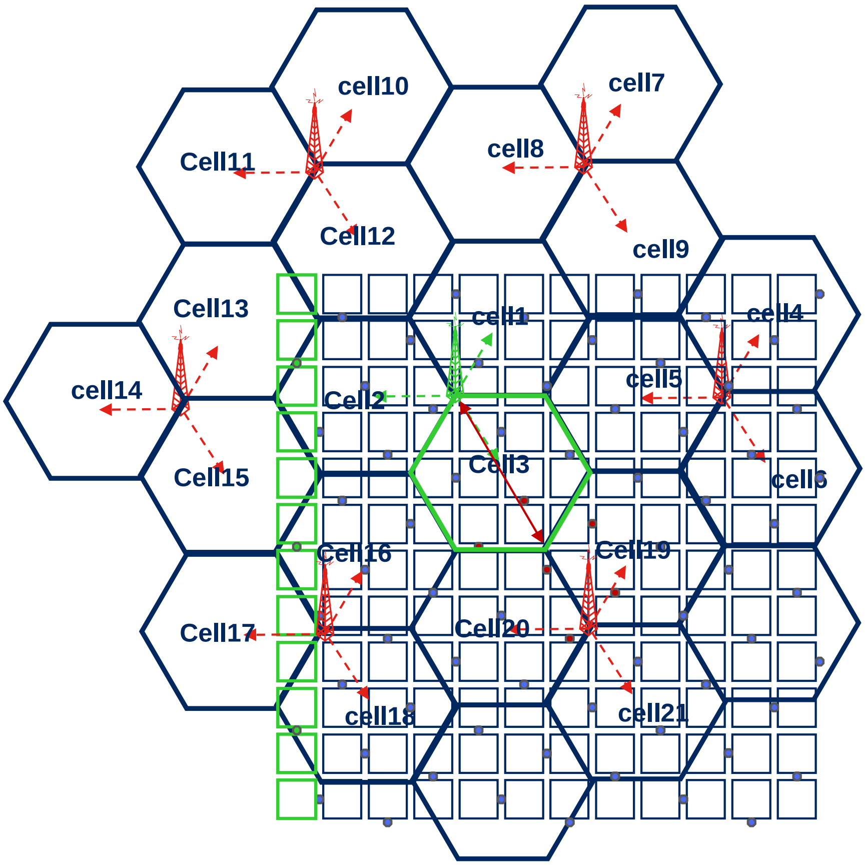

Figure 6.3.1.2-3: Manhattan grid micro node network overlaid on a Case 1 (ISD = 500 m) macro network. The Manhattan grid is centred on the corner between cell#3/19/20 in the macro network.

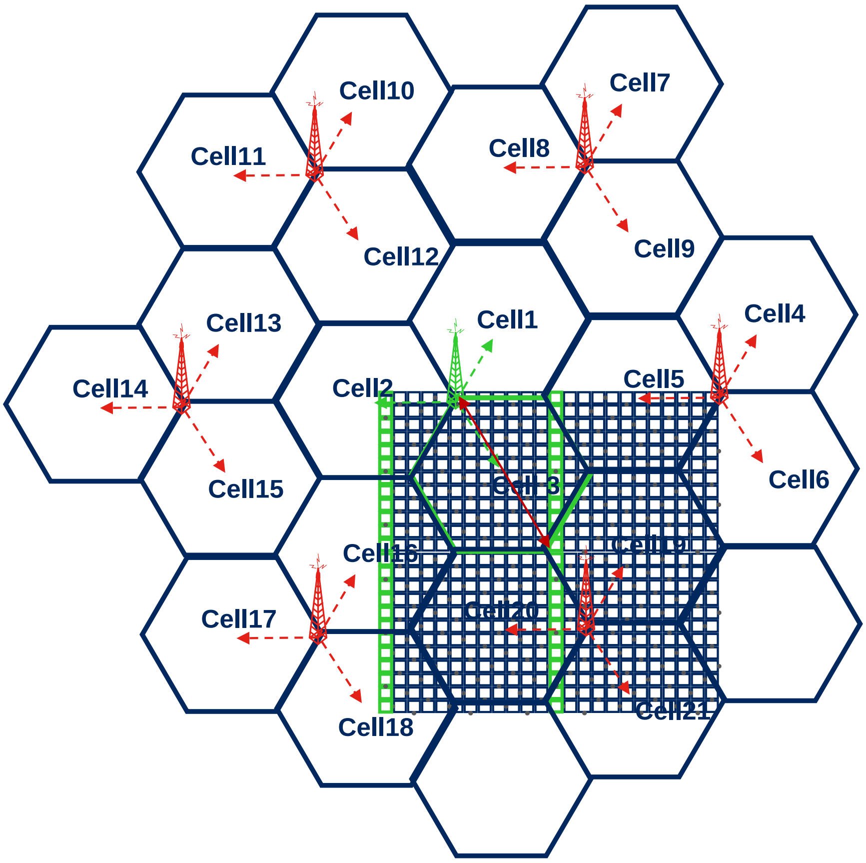

Figure 6.3.1.2-4: Four-fold replication of the Manhattan grid micro node network overlaid on a Case 3 (ISD = 1732 m) macro network. The overlaid grid is centered on corner between cell#3/19/20 of the macro network.

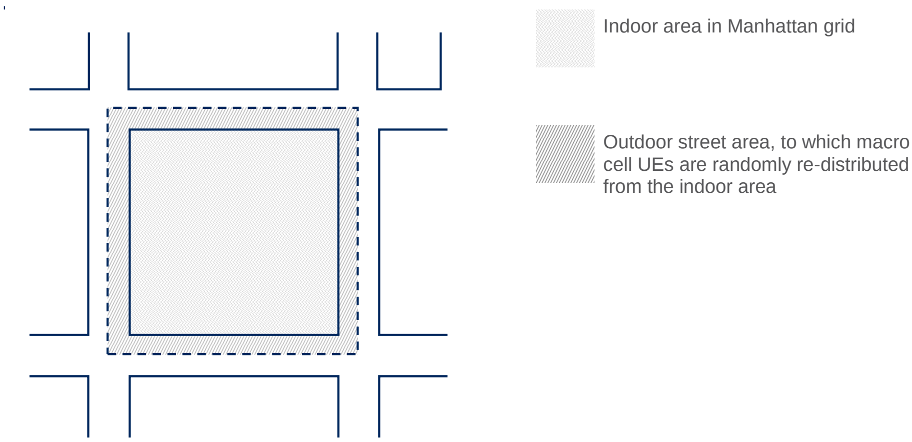

Figure 6.3.1.2-5: Method of re-distributing UEs from the indoor to the street area.

For micro-to-micro simulations with overlaid patterns, the following layout is used for the overlaid patterns:

- The layout of Figure 6.3.1.2-6 is used, with the modified 12 column micro grid pattern overlaid on a second modified grid pattern.

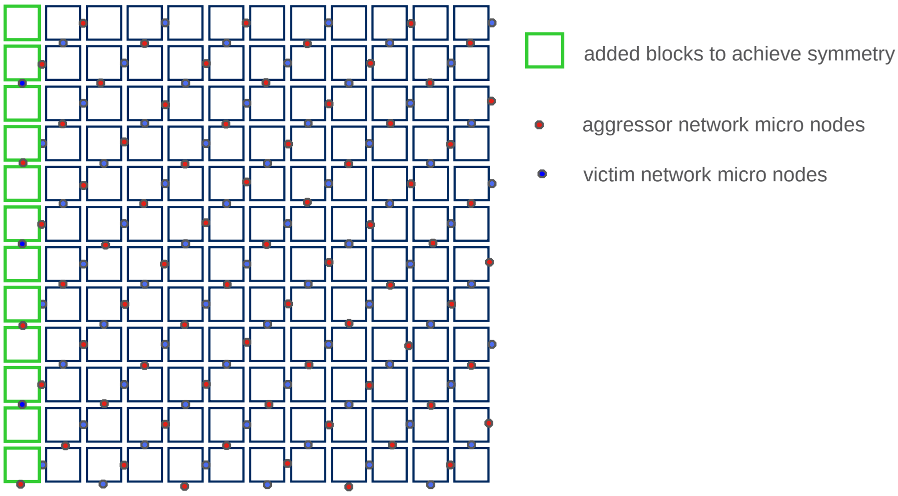

Figure 6.3.1.2-6: Modified Manhattan micro network grid overlaid on a modified Manhattan micro network grid.

6.3.2 Deployment parameters

Table 6.3.2-1: Macro cell deployment parameters

Simulation Parameter	Parameter value
Grid Pattern	Hex grid 19 sites/57 cells (Figure 6.3.1.1-1)
Cell sectorization	Tri-sector
Macro cell radius	ISDs of 500 m and 1732 m
BS antenna pattern	Antenna Pattern for 3-Sector Cells according to 3GPP TR 36.942 [7]
Antenna gain (including losses) a) Base station b) Mobile	 15 dBi 0 dBi UE
MCL (Macro BS-to-UE)	70 dB
Log-normal shadow fading Standard deviation Macro site to micro site correlation Macro site-to-macro site correlation Micro site to micro site correlation Intra site correlation	 10 dB 0 0.5 0.5 1
Number of UEs	3 active UE drops per sector per snapshot (as defined in 3GPP TR 36.942 [7])
Macro UE distribution in area covered by Macro network, but not covered by Micro network	Random and uniform distribution
Macro UE distribution in area overlapped by Micro network	Random and uniform distribution over the streets of the Manhattan grid according to the description in 6.3.1.2 and Figure 6.3.1.2-5.
Collection of output statistics	Use cell#3 in the Macro grid (See figure 6.3.1.2-3 and 6.3.1.2-4)

Table 6.3.2-2: Micro cell deployment parameters

Simulation Parameter	Agreed assumptions
Grid Pattern	Manhattan grid (modified) (Figure 6.31.2-1 (12x12) or 6.3.1.2-2 (24x24))
Cell sectorization	Omni
BS antenna pattern	Omni-directional
Antenna gain (including losses) a) Base station b) Mobile	 11 dBi 0 dBi UE
MCL (Micro BS-to-UE)	53 dB
Log-normal shadow fading Standard deviation Site-to-site correlation Intra site correlation	 8 dB 0.5 1
Number of UEs	3 active UE drops per micro cell per snapshot
UE distribution	Random and uniform distribution over the streets of the Manhattan grid
Collection of output statistics	12x12 grid: Use the "center" 7 cells as identified in Figure 6.3.1.2-1. 24x24 "extended grid": Use the "center" 7 cells in Figure 6.3.1.2-2 (centered on the mid point of the grid).

6.3.3 System parameters

Table 6.3.3-1: Simulation Assumptions for E-UTRA macro cell

Simulation Parameter	Parameter value
Bandwidth	10 MHz
Noise figure	5 dB
Maximum TX power for LTE macro BS UE	 46 dBm/10 MHz 23 dBm
Minimum TX power LTE UE	-40 dBm
Power control for LTE UE	PC1 and PC2 model from 3GPP TR 36.942 [7]. NOTE: PL-xile for ISD1732m Macro cell may need to be reconsidered.
ACIR	Fixed -30/-43 dB, using ACIR model in clause 5.1.1.3 of 3GPP TR 36.942 [7] (with X=0)

Table 6.3.3-2: Simulation Assumptions for UTRA macro cell

Simulation Parameter	Parameter value
Bandwidth	3.84 MHz
Noise figure	5 dB
UL SINR target for UTRA	6.1 dB (for speech) in section 5.1.6.2.1 of TR 25.942 3GPP [5]
Processing gain for UTRA	25dB
Maximum TX power for UTRA UE	21 dBm
Minimum TX power for UTRA UE	-44 dBm
Power control for UTRA UE	Fast inner loop power control in section 5.1.6.2 of 3GPP TR 25.942 [5]
ACIR	Fixed -30/-43/-49dB, using ACIR model (EUTRA to UTRA) in clause 12.1.3.1 of 3GPP TR 36.942 [7] (with X=0)

Table 6.3.3-3: Simulation Assumptions for E-UTRA micro cell

Simulation Parameter	Parameter value
Bandwidth	10 MHz
Noise figure	5-13 dB (Minimum range to cover)
Maximum TX power for LTE Micro BS UE	 38 dBm/10 MHz 23 dBm
Minimum TX power LTE UE	-40 dBm
Power control for LTE UE	PC model in section 6.3.5.
ACIR	Fixed -30/-43 dB, using ACIR model in clause 5.1.1.3 of 3GPP TR 36.942 [7] (with X=0)
Number of UEs	3 active UE drops per micro cell per snapshot
UE distribution	Uniformly distributed in the streets of the Manhattan grid

Table 6.3.3-4: Simulation Assumptions for UTRA micro cell

Simulation Parameter	Parameter value
Bandwidth	3.84 MHz
Noise figure	15 dB
UE distribution	Uniformly distributed in the streets of the Manhattan grid
UL SINR target for UTRA	3.3 dB (for speech) in section 5.1.6.2.1 of 3GPP TR 25.942 [5]
Processing gain for UTRA	25 dB
Maximum TX power for UTRA UE	21 dBm
Minimum TX power for UTRA UE	-44 dBm
Power control for UTRA UE	Fast inner loop power control in section 5.1.6.2 of 3GPP TR 25.942 [5]
ACIR	Fixed -30/-43/-49dB, using ACIR model (EUTRA to UTRA) in clause 12.1.3.1 of 3GPP TR 36.942 [7] (with X=0)

The thermal noise level at the receiver to use in the simulations is determined from the Noise figure (NF) and the receiver noise Bandwidth (B) as follows:

$$N_{\text{Thermal}} = -174 + 10\log(B) + NF \;\; [\text{dBm}]$$

It should be noted that the total thermal noise at the receiver is calculated with the actual 10 MHz channel bandwidth (9 MHz noise BW in 50 RBs) according to the equation above, while the BS reference sensitivity is based on a 25 RB wanted signal and corresponding noise bandwidth (4.5 MHz) (refer to section 7.2.1 in TS 36.104 [3]).

Table 6.3.3-5: Common Simulation parameters

Simulation Parameter	Parameter value
Carrier frequency (for propagation model)	2 GHz
Data traffic model	Full buffer traffic
Cell selection	Based on a simple path loss criteria (including shadowing) in the UEs own network (each micro and/or macro network is independent, i.e. no overlay/underlay network is assumed)
Performance evaluation	Throughput loss criteria apply to E-UTRA to E-UTRA co-existence simulations, as derived from the truncated Shannon bound approach of 3GPP TR36.942 [7]. Capacity loss criteria apply to E-UTRA to UTRA co-existence simulations: the number of users corresponding to a 6 dB noise rise over the thermal noise in the UL as defined in 3GPP TR25.942 [5].
Output statistics (Impact on BS noise floor)	The noise floor versus throughput loss (5th percentile and average) of the victim networks; Plots for macro & micro victim BS.
Output statistics (Interferer levels)	Cdf of the received interference power in dBm from an aggressor (Enlarged to show 99.99% point)

6.3.4 Propagations models

6.3.4.1 Macro cell model

For UEs assigned to macro cells, the model of paragraph 4.5.2 of 3GPP TR 36.942 [7] applies, assuming a carrier frequency of 2 GHz. For the micro-to-macro scenario, this model also applies for propagation between UEs assigned to a micro cell and a macro BS.

6.3.4.2 Micro cell model

For UEs assigned to micro cells, the model of 3GPP TR 25.942 [5] as defined in paragraph 5.1.4.3 applies. For the macro-to-micro scenario, this model also applies for propagation between UEs assigned to a macro cell and a micro BS.

6.3.5 Power control model (PC3)

In TR36.942, the following power control equations are used for coexistence studying:

$$P_t = P_{\max} \times \min\left\{1, \max\left[R_{\min}, \left(\frac{CL}{CL_{x-ile}}\right)^{\gamma}\right]\right\} \qquad (1)$$

The principles of selecting uplink power control parameters for E-UTRA Macro BS in Rel-8 coexistence studying could be adopted for E-UTRA Micro BS as following:

- To ensure coexistence as much as possible, the interference caused by the interfering UEs to the victim UTRA or E-UTRA system should be minimized. This implies that the interfering UEs transmit power should be tightly controlled.
- To provide realistic coexistence results, the aggressor E-UTRA systems are expected to operate under normal conditions, in other words, have both good cell throughput and cell edge user throughput.

The power control parameters can be selected depending on the scenarios and above principles.

7 RF requirements for Medium Range BS

7.1 Void

7.2 Base station output power

In TS 36.104, E-UTRA BS reuses the definitions of output power, rated output power and maximum output power in TS25.104. Therefore it is suggested that E-UTRA MR BS could also reuse UTRA MR BS rated output power requirement. For MSR MR BS, it is recommended to align its rated carrier output power with UTRA MR BS rated output power requirement as well in order to harmonize the requirement among different specifications.

7.3 Frequency error

Frequency error for MR is a single RAT requirement that is referenced from the MSR specification and it thus only needs to be specified in the E-UTRA specification. Selecting a value aligned with the UTRA MR frequency error requirement (±0.1 ppm) will allow for same relaxation for E-UTRA MR BS (compared to WA) and also provides harmonization between RATs.

7.4 Spurious emissions (additional)

The mandatory spurious emission limits for Category A and B remain unchanged, since they are based on regulation and do not depend on BS class. The requirements for "co-existence with systems operating in other frequency bands" are in general not based on regulation and are also defined independent of BS classes, except for the specific requirement for Home BS, which is based on a very different scenario.

The requirement for protection of own BS receiver and the limits for co-location with other BS are however dependent on BS class. The spurious emission limit for receiver protection and co-location are based on a 30 dB MCL (BS Tx to BS Rx) and 0.8 dB allowed degradation of the BS receiver 3GPP TR 37.900 [12].

7.4.1 Requirement for E-UTRA BS

The MR BS requirements for protection of BS receiver and co-location are both derived from the MR BS reference sensitivity that is set with 5 dB desensitization compared to a WA BS. This results in a limit of -91 dBm in 100 kHz.

7.4.2 Requirement for MSR

Due to the different Reference Sensitivity of the MR and LA BS class, the requirements for protection of BS receiver and co-location will also be different for MR BS, set by the most restrictive (lowest) of the UTRA and E-UTRA values. For Medium Range MSR BS, the limits (measured in 100 kHz) are set to -91 dBm, being the most restrictive of -91 dBm (from E-UTRA) and -86 dBm (from UTRA).

7.5 Operating band unwanted emissions

7.5.1 Requirement for E-UTRA

The same methodology as that for Macro BS is used for deriving E-UTRA MR BS unwanted emission mask.

Specifically the following points are considered.

1. UEM should reflect the scaling of E-UTRA MR BS output power from 38dBm down to 31dBm.
2. Separate UEM should be defined for 1.4 MHz, 3 MHz, 5 MHz and above channel bandwidth
3. Same amount of relaxation as that for E-UTRA Wide Area BS should be considered in the first adjacent channel for E-UTRA MR BS

4. E-UTRA ACLR2 requirement should be maintained for the UEM in the 2nd adjacent channel. For channel bandwidth higher than 5 MHz a 1.5 dB margin is considered, which is the same as for the corresponding mask for E-UTRA Wide Area BS.

5. The emission requirement in the spurious emission domain is a natural extension in the 2nd adjacent channel but over ruled by the -15dBm/MHz regulatory requirement.

Based on these considerations, the E-UTRA MR BS UEM is plotted in figure 7.5.1-1.

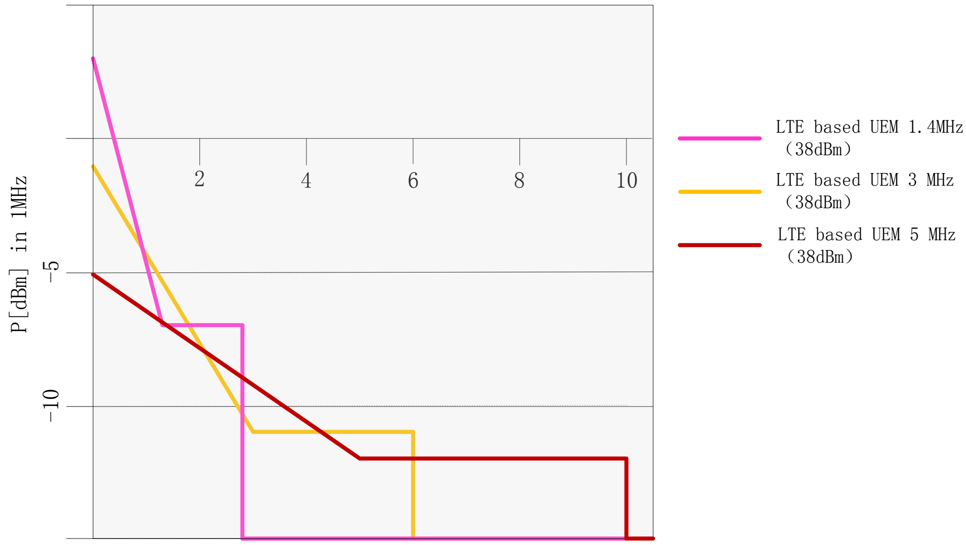

Figure 7.5.1-1: UEM for E-UTRA MR BS (38dBm)

7.5.2 Requirement for MSR

7.5.2.1 Requirement for BC1

The generic operating band unwanted emissions limits for Wide Area BS is based on stricter limit between E-UTRA and UTRA mask. In this way the co-existence is guaranteed. The same derivation principle could be taken for Medium Range BS.

Both UTRA and E-UTRA Medium Range UEM limits are set relative to the output power from 38dBm down to 31 dBm. For output power below 31 dBm, the UEM would have only absolute limits. Thus the same condition shall apply for MSR Medium Range UEM.

The additional 200 kHz offset between small carrier channel (1.4 and 3 MHz) edge and RF BW edge should be considered for BC1. It results the 1.4 and 3 MHz E-UTRA masks are shifted 200 kHz leftwards in figure 7.5.2.1-1 and 7.5.2.1-2. In addition, this methodology shall not apply for BC2 since no additional frequency offset is allowed.

By comparing UTRA mask and E-UTRA mask for each bandwidth in figure 7.5.2.1-1 and 7.5.2.1-2, it could be observed that 5 MHz E-UTRA mask dominates the near end and UTRA mask dominates the remaining part. The only exception is when the maximum output power is larger than 37 dBm, where the limit should be no higher than -15 dBm/MHz in 2.6 to 5 MHz frequency offset, restricted by the spurious emissions of 1.4 MHz bandwidth carrier. The resulting UEM for MSR Medium Range is shown as a pink curve in figure 7.5.2.1-1 and 7.5.2.1-2. The slope of the near-end of the MR-BS mask is chosen as 5/3 instead of 7/5 (from E-UTRA mask) in order to ensure that the mask is contiguous at $\Delta f = 0.6$ MHz.

The crossover point between 5 MHz E-UTRA mask and UTRA mask would be fixed at frequency offset value of about 0.6 MHz through calculation.

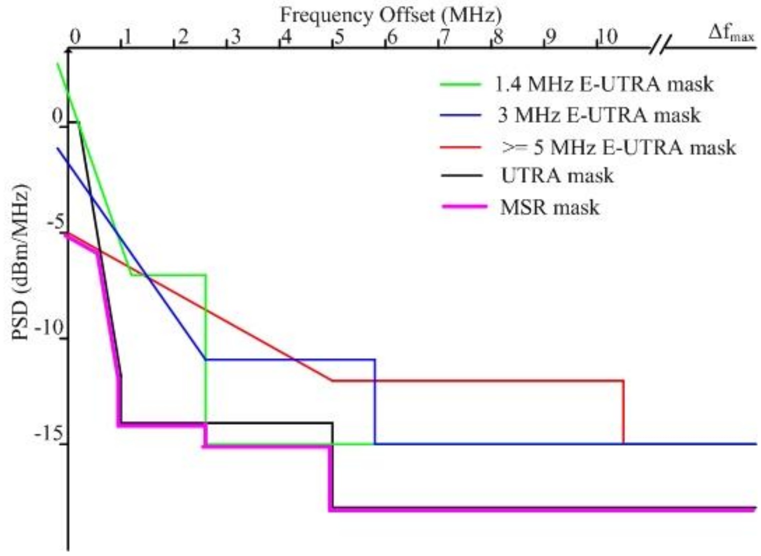

Figure 7.5.2.1-1 comparison of UEM (Pout = 38 dBm)

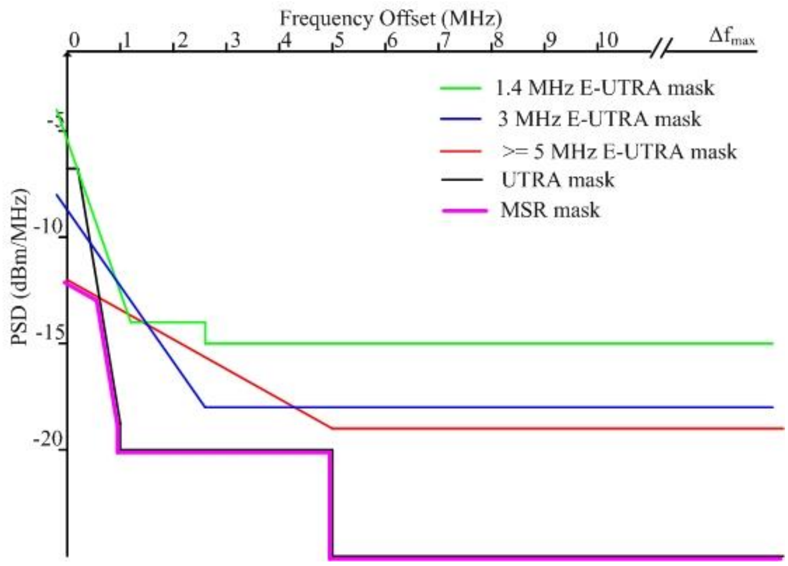

Figure 7.5.2.1-2 comparison of UEM (Pout <= 31 dBm)

7.5.2.2 Requirement for BC2

When deriving the UEM for the Wide Area MSR BS as shown in 3GPP TR 37.900 [12], the baseline level for the UEM in BC2 is the BC1 mask. As GSM operation is supported in BC2, a modification is needed when GSM carrier or small E-UTRA carrier (1.4 or 3 MHz) is placed at the RF bandwidth edge. The reason is that the GSM modulation spectrum would exceed the BC1 mask in the near end of unwanted emissions domain.

A similar modification can be made to the BC1 mask of MSR Medium Range BS in order to form a BC2 mask. It is proposed that the modified part of the mask would be based on the MR MCBTS mask (TS45.005 Subclause 4.2.1) for 8PSK at Pout = 38 dBm. Note that for MR MCBTS, the mask described by table for normal BTS in 3GPP TS 45.005 [10] is re-used. For output power levels between 31 dBm and 38 dBm, the mask limits are set relative to the output power in the same way as the baseline BC1 mask.

According to figure 7.5.2.2-1, the first ~150 kHz outside the RF bandwidth edge would be restricted based on GSM spectrum mask.

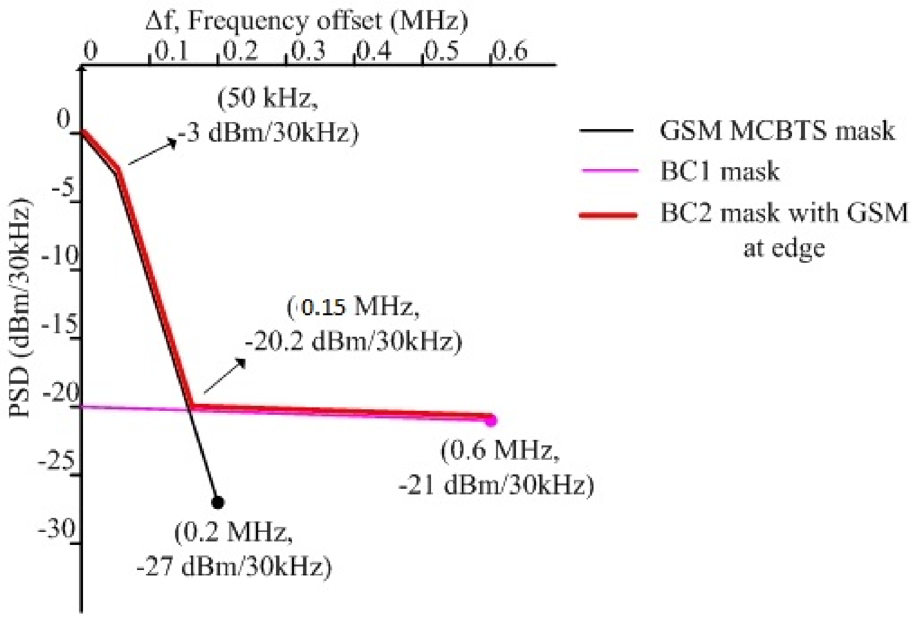

Figure 7.5.2.2-1 UEM for BC2 with a modified level based on an 8PSK GSM MR MCBTS mask (Pout = 38 dBm)

7.6 ACLR

7.6.1 Requirement for E-UTRA

BS transmitter ACLR, together with the UE receiver ACS, determines the RF isolation (see equation 6.6-1) between aggressor system and the victim system.

$$ACIR = \frac{1}{\frac{1}{ACLR} + \frac{1}{ACS}}$$

Since the ACS of UE is specified as a constant and unified value of 33dB irrespective of the operating condition, further tightening ACLR requirement beyond 45dB has little improvement on ACIR. Also considering that 45dB has been adopted by Macro eNB, Pico eNB and HeNB, there is also no need to further relax the MR eNB ACLR requirement below 45dB from implementation point of view.

45dB is reused for E-UTRA MR BS relative ACLR requirement.

For the E-UTRA ACLR requirement, there are absolute ACLR limits set at -13 dBm/MHz and -15 dBm/MHz respectively for Category A and B emission limits. The levels align with the unwanted emission mask limits that apply more than 10 MHz from the channel edges. While there is no absolute ACLR limit set for UTRA MR BS, there is a “floor” in terms of a lowest limit for the UTRA spectrum mask at -25 dBm/MHz.

A level of -25 dBm/MHz is chosen as an absolute limit for MR BS ACLR for multiple reasons:

1. The absolute ACLR limit for E-UTRA MR BS class should be in the range between -15dBm/MHz and -32dBm/MHz, which are the limits for WA and LA BS. Taking MSR requirements into consideration, an E-UTRA MR absolute ACLR limit of -25 dBm/MHz is aligned with the lower bound of the SEM for UTRA at similar power level.

2. A -25 dBm/MHz absolute limit can be compared with the ACLR limit for the frequency ranges concerned. It would then correspond to at least a 45 dB ACLR down to a BS power level of 26 dBm for carriers up to 5 MHz channel BW.

3. Another way of expressing the point above is that for a BS with 31 dBm output power (the lowest power for the UTRA mask definition), an absolute limit of -25 dBm/MHz is 5 dB below the relative ACLR limit.

4. The chosen value ensures approximately the same level of interference at victim UEs as for an LA BS as aggressor, taking the LA BS limit of -32 dBm/MHz and the difference in MCL into account (53 dB vs. 45 dB).

7.6.2 Requirement for MSR

ACLR is a single-RAT requirement and does therefore not need to be updated for the MR E-UTRA BS class.

The CACLR requirement for MSR BS has a *relative* limit that is general and an *absolute* limit that would depend on BS class. For MR MSR BS, the same absolute CACLR value of -25 dBm/MHz as is used for the E-UTRA MR BS absolute ACLR.

7.7 Transmitter intermodulation

The transmitter intermodulation requirement is a composite requirement where all unwanted emission requirements apply when an interferer is injected into the transmitter. The requirement is thus BS class specific, since it references unwanted emission limits that depend on BS class.

Unwanted emission limits in subclause 6.6 of TS 36.104 are:

- Clause 6.6.1: Occupied bandwidth;
- Clause 6.6.2: Adjacent Channel Leakage power Ratio (ACLR)
- Clause 6.6.3: Operating band unwanted emissions
- Clause 6.6.4: Transmitter spurious emissions

Unwanted emission limits in subclause 6.6 of TS 37.104 are:

- Clause 6.6.1: Transmitter spurious emissions
- Clause 6.6.2: Operating band unwanted emissions
- Clause 6.6.3: Occupied bandwidth;
- Clause 6.6.4: Adjacent Channel Leakage power Ratio (ACLR)

As transmitter intermodulation is tested through unwanted emissions through direct reference to the clauses listed above, there is no need to change the core requirement in subclause 6.7 of both TS 36.104 and TS 37.104. The interfering signal is already specified to be 30 dB below the wanted signal in Table 6.7.1-1 of both TS 36.104 and TS 37.104 and is applicable to all BS classes.

7.8 Reference sensitivity

The reference sensitivity power level $P_{REFSENS}$ is the minimum mean power received at the antenna connector at which a throughput requirement shall be met for a specified reference measurement channel.

Reference sensitivity for medium range BS is proposed as in Table 7.8-1 based on 10 dB noise rise.

Table 7.8-1 Medium Range BS reference sensitivity levels

E-UTRA channel bandwidth [MHz]	Reference measurement channel	Reference sensitivity power level, PREFSENS [dBm]
1.4	FRC A1-1 in Annex A.1	-101.8
3	FRC A1-2 in Annex A.1	-98.0
5	FRC A1-3 in Annex A.1	-96.5
10	FRC A1-3 in Annex A.1*	-96.5
15	FRC A1-3 in Annex A.1*	-96.5
20	FRC A1-3 in Annex A.1*	-96.5
Note*: $P_{REFSENS}$ is the power level of a single instance of the reference measurement channel. This requirement shall be met for each consecutive application of a single instance of FRC A1-3 mapped to disjoint frequency ranges with a width of 25 resource blocks each		

7.8.2 Requirement for MSR

Reference sensitivity requirement in existing MSR specification is specified as single-RAT only requirement. This requirement can be kept unchanged for MSR MR BS in TS 37.104.

7.9 Receiver dynamic range

7.9.1 Requirement for E-UTRA

The receiver dynamic range requirement is derived using the same approach as for E-UTRA LA BS. The wanted signal and interfering signal are scaled by 5dB reference sensitivity degradation compared to Macro BS.

7.9.2 Requirement for MSR

For both UTRA and E-UTRA, the dynamic range is specified as a measure of the capability of the receiver to receive a wanted signal in the presence of an interfering signal inside the received channel bandwidth. In this condition a throughput requirement for E-UTRA and BER requirement for UTRA shall be met for a specified reference measurement channel.

The receiver dynamic range for the GSM Base Station is mainly defined by the Nominal Error Rate requirement, which defines BER limits at considerably higher received signal levels than the reference sensitivity level.

Since the rationale for and definition of those dynamic range requirements are very RAT specific, single RAT specifications are used for MSR WA BS in current TS37.104. Therefore Rx dynamic range requirement for MSR MR BS can be referred to each single RAT specification as well. No changes are needed for current TS37.104 due to introduction of MSR MR BS class.

7.10 In-band blocking

7.10.1 Requirement for E-UTRA

The in-band blocking requirement for E-UTRA BS is in subclause 7.6.1 of 3GPP TS 36.104 [3]. Simulation results for different blocking scenarios are presented in clause 6.

The wanted signal mean power is set relative to the reference sensitivity in the same way as for LA and WA BS. The difference between the wanted signal level and in-band blocking signal level defines the dynamic range window for in-band signals and thereby the selectivity of the BS receiver implementation. Assuming that a Medium Range BS will not have a larger dynamic range window and thereby no stricter receiver selectivity requirement than a Wide Area BS, and with a 5 dB desensitization of the receiver as proposed in 3GPP TR 36.942 [7], the in-band blocking level will be -43+5dBm = -38dBm.

7.10.2 Requirement for MSR

The in-band blocking requirement for MSR BS is in subclause 7.4 of 3GPP TS 37.104 [4].

For UTRA MR BS, the blocking requirement is based on a UTRA signal with a mean power of -35 dBm. The interfering signal is specified with a minimum offset of 10 MHz from the centre frequency of the wanted signal.

For E-UTRA MR BS, the blocking requirement is based on an E-UTRA interfering signal with mean power of -38 dBm (as derived in subclause 7.10.1) and a minimum offset from the RF bandwidth edge that depends on the RF bandwidth of the carrier.

A receiver requirement is more stringent when the difference between the blocker level and the associated noise level is higher. UTRA and E-UTRA MR receiver requirements cannot be easily compared as different noise levels are considered for UTRA and E-UTRA reference sensitivity requirements. Reference sensitivity level difference between Wide Area and Medium Range BSs is equal to 10 and 5 dB for UTRA and E-UTRA, respectively. Therefore, even though the UTRA interfering signal is 3 dB stronger than the E-UTRA one, the E-UTRA requirement is more stringent than the UTRA one as the noise level difference between UTRA and E-UTRA is 5 dB.

In order to maintain the requirement level of both UTRA and E-UTRA for MSR BS, the stronger interfering signal is selected for MR MSR BS, with the blocking requirement based on the UTRA interfering signal mean power of -35dBm. In order to maintain the dynamic range window and create the same difference between the blocker level and the associated noise level in UTRA and E-UTRA, the wanted signal mean power is consequently increased by 3 dB for the E-UTRA requirement.

7.11 Narrowband blocking

7.11.1 Requirement for E-UTRA

The narrowband blocking requirement for E-UTRA BS is in subclause 7.5 of 3GPP TS 36.104 [3].

The wanted signal mean power is set relative to the reference sensitivity in the same way as for LA and WA BS. The requirement is set with consideration of the receiver dynamic range window and receiver selectivity in the same way as for in-band blocking in clause 7.10.1, resulting in a narrowband blocking level of -44 dBm.

7.11.2 Requirement for MSR

The narrowband blocking requirement for MSR BS is in subclause 7.4.2 of 3GPP TS 37.104 [4].

For UTRA MR BS, the blocking requirement is based on a GMSK signal with a mean power of -42 dBm. The interfering signal is specified with an offset of 2.6 or 2.7 MHz from the centre frequency of the wanted signal.

For E-UTRA MR BS, the blocking requirement is based on a single RB E-UTRA interfering signal with mean power of -44 dBm (as derived in subclause 7.11.1) and with multiple offsets defined in the first adjacent channel.

Similar as the methodology of defining MSR WA BS narrowband blocking requirement, a generic MSR narrowband blocking requirement is derived, based on an E-UTRA 1RB interfering. The interfering signal frequency offset from the RF bandwidth edge is the same with the requirement for MSR WA BS. The wanted signal mean power levels for different RAT carriers are aligned with existing single RAT specifications.

A receiver requirement is more stringent when the difference between the blocker level and the associated noise level is higher. UTRA and E-UTRA LA receiver requirements cannot be easily compared as different noise levels are considered for UTRA and E-UTRA reference sensitivity requirements. Reference sensitivity level difference between Wide Area and Medium Range BSs is equal to 10 and 5 dB for UTRA and E-UTRA, respectively. Therefore, even though the UTRA interfering signal is 2 dB stronger than the E-UTRA one, the E-UTRA requirement is more stringent than the UTRA one as the noise level difference between UTRA and E-UTRA is 5 dB. In addition, the E-UTRA interfering signal is more stringent than a GMSK modulated signal due to higher PAPR. Similar to the MSR WA BS narrowband blocking requirement, the MSR MR BS requirement is for these reasons derived from the more stringent of the UTRA and E-UTRA requirements and is thus based on the proposed E-UTRA MR requirement.

7.12 Adjacent channel selectivity (ACS)

7.12.1 Requirement for E-UTRA

For ACS requirement of E-UTRA Medium Range BS, the same deriving approach as LA BS is applied. The wanted signal and interfering signal level are both increased by 5dB reference sensitivity desensitization compared with WA BS, which is referred from subclause 7.2. The interfering signal type and frequency offset are kept the same as WA/LA/Home BS.

7.12.2 Requirement for MSR

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. For MSR BS, the selectivity in the adjacent channel is fully verified by the narrowband blocking and there is no separate ACS requirement. This also holds for MSR MR Base Stations. No change is needed for TS 37.104.

7.13 Out-of-band blocking

7.13.1 Requirement for E-UTRA

The out-of-band blocking requirement for E-UTRA BS is in subclause 7.6.1 of 3GPP TS 36.104 [3]. For general out-of band blocking requirement, a fixed power level of -15 dBm interfering signal is to be placed in out-of-band blocking region, independent on specific BS class and it is defined as a CW interferer at -15 dBm and excludes the frequency range from 20 MHz below the lowest frequency of the uplink operating band up to 20 MHz above the highest frequency of the uplink operating band. For the MR E-UTRA BS class, it is derived using same approach as for E-UTRA LA BS. The wanted signal mean power is set relative to the reference sensitivity, while the interfering signal mean remains at -15 dBm.

The blocking requirement for E-UTRA BS co-location is in subclause 7.6.2 of 3GPP TS 36.104 [3] and applies for co-location with the BS of the same class, for the protection of BS receivers when E-UTRA, UTRA, CDMA or GSM/EDGE BS operating in a different frequency band are co-located with a BS. Based on a 38 dBm BS power and 30 dB MCL, a blocking interferer level of +8 dBm is derived and applied for all co-location cases, including co-location with GSM/EDGE.

For GSM/EDGE, co-location with the same base station class is assumed, in this case the Medium Range multicarrier BTS class defined in 3GPP TR 45.005 [8]. Based on the maximum multicarrier BTS power of 38 dBm, this means that the same limit will apply for co-location with Medium Range GSM multicarrier BTS as for co-location with MR UTRA and E-UTRA. No GSM multicarrier margin will be needed since the maximum power is defined over all carriers.

7.13.2 Requirement for MSR

The out-of-band blocking requirement for MSR BS is in subclause 7.5.1 of 3GPP TS 37.104 [4]. For the MR MSR BS class, the interfering signal mean remains at -15 dBm and is also identical to the level for MR UTRA and MR E UTRA BS. The existing requirement thus covers also MR MSR BS and no change of the requirement is needed.

The blocking requirement for MSR BS co-location is in subclause 7.5.2 of 3GPP TS 37.104 [4] and applies for co-location with the BS of the same class, for the protection of BS receivers when E-UTRA, UTRA, CDMA or GSM/EDGE BS operating in a different frequency band are co-located with a BS. Based on a 38 dBm BS power and 30 dB MCL, a blocking interferer level of +8 dBm is derived and applied for all co-location cases, including co-location with GSM/EDGE.

For GSM/EDGE, co-location with the same base station class is assumed, in this case the Medium Range multicarrier BTS class defined in 3GPP TR 45.005 [8]. Based on the maximum multicarrier BTS power of 38 dBm, this means that the same limit will apply for co-location with Medium Range GSM multicarrier BTS as for co-location with MR UTRA and E-UTRA. No GSM multicarrier margin will be needed since the maximum power is defined over all carriers.

7.14 Receiver spurious emissions

The spurious emissions power is the power of emissions generated or amplified in a receiver that appear at the BS receiver antenna connector. For the general Rx spurious emission limit, it is aligned with Tx spurious emission. This means that independent of the BS classes, the same generic Rx spurious emission requirements are applied. And the additional Rx spurious emission requirements for co-existence and co-location are directly referred to the additional Tx spurious emission requirements defined for different BS classes.

The receiver spurious emission requirement for E-UTRA BS is in subclause 7.7 of 3GPP TS 36.104 [3] and for MSR BS is subclause 7.6 of TS 37.104 [4]. The limits remain unchanged for MR BS, since they are based on regulation and do not depend on BS class, in the same way as the mandatory spurious emission limits for the transmitter. The referenced limits for protection of the E-UTRA FDD BS receiver of own or different BS and for Co-existence with other systems in the same geographical area will depend on the BS class, but this does not mandate any change to the clause on receiver spurious emissions.

Therefore no change is needed for Rx spurious emissions requirements defined in TS 36.104 and TS 37.104 for E-UTRA and MSR MR BS, respectively.

7.15 Receiver intermodulation

7.15.1 Requirement for E-UTRA

The receiver intermodulation requirement for E-UTRA BS is in subclause 7.8 of 3GPP TS 36.104 [3].

Wanted signal mean power is set relative to the reference sensitivity in the same way as for Local Area and Wide Area BS. The difference between the wanted signal level and interfering signal defines the dynamic range for in-band signals and thereby the selectivity of the BS receiver implementation. Assuming that a Medium Range BS will not have a larger dynamic range and thereby no stricter receiver selectivity requirement than a Wide Area BS, and assuming a 5 dB desensitization of the receiver compared to a Wide Area BS as proposed in 3GPP TR 36.942 [7] yields an interfering signal level of -47 dBm for the Medium-Range BS receiver intermodulation requirement.

7.15.2 Requirement for MSR

The receiver intermodulation requirement for MSR BS is in subclause 7.7 of TS 3GPP 37.104 [4].

For the MSR receiver intermodulation requirement, it is desirable to align the unwanted signal type. The UTRA and E-UTRA requirements are similar for the general intermodulation requirement, so the stronger interfering signal mean power of −44 dBm from the UTRA specification is used for the Medium Range requirement. In order to maintain the dynamic range window and create the same difference between the interferer levels and the associated noise level for E-UTRA in the single-RAT and MSR specifications, the E-UTRA wanted signal mean power is consequently increased by 3 dB for the E-UTRA MR MSR general requirement.

The narrowband MSR intermodulation requirement is derived from the following considerations.

- For the UTRA MR BS, the RX narrow band intermodulation requirement is based on a CW signal and GMSK modulated signal with mean power of −43 dBm.
- For the E-UTRA MR BS, it is proposed the narrow band intermodulation requirement is based on a CW signal and an E-UTRA signal with mean power of −47 dBm on one RB.

UTRA and E-UTRA medium range receiver requirements cannot be compared easily as different noise levels are considered for UTRA and E-UTRA reference sensitivity requirements. The reference sensitivity level difference between Wide Area and Medium Range BSs is equal to 10 and 5 dB for UTRA and E-UTRA, respectively. Therefore, even though the UTRA interfering signal is 4 dB stricter than the E-UTRA interferer, the E-UTRA requirement is stricter compared to the UTRA requirement because the noise level difference between UTRA and E-UTRA is 5 dB and the E-UTRA interfering signal is more stringent than a GMSK modulated signal due to higher PAPR. Similar to the MSR WA BS narrowband intermodulation requirement, the MSR MR BS requirement is derived from the more stringent of the UTRA and E-UTRA requirements and is thus based on the proposed E-UTRA MR requirement.

7.16 In-channel selectivity

7.16.1 Requirement for E-UTRA

The in channel selectivity requirement for E-UTRA BS is in subclause 7.4 of 3GPP TS 36.104 [3].

In-channel selectivity (ICS) is a measure of the receiver ability to receive a wanted signal at its assigned resource block locations in the presence of an interfering signal received at a larger power spectral density. The in-channel selectivity requirement for MR BS is derived from its reference sensitivity, where 5dB degradation is observed compared to E-UTRA WA BS. Therefore the wanted signal and interfering signal levels for MR E-UTRA BS is shown in Table 7.16-1.

Table 7.16.1: E-UTRA Wide Area BS in-channel selectivity

E-UTRA channel bandwidth (MHz)	Reference measurement channel	Wanted signal mean power [dBm]	Interfering signal mean power [dBm]	Type of interfering signal
1.4	A1-4 in Annex A.1	-101.9	-82	1.4 MHz E-UTRA signal, 3 RBs
3	A1-5 in Annex A.1	-97.1	-79	3 MHz E-UTRA signal, 6 RBs
5	A1-2 in Annex A.1	-95.0	-76	5 MHz E-UTRA signal, 10 RBs
10	A1-3 in Annex A.1	-93.5	-72	10 MHz E-UTRA signal, 25 RBs
15	A1-3 in Annex A.1*	-93.5	-72	15 MHz E-UTRA signal, 25 RBs*
20	A1-3 in Annex A.1*	-93.5	-72	20 MHz E-UTRA signal, 25 RBs*
Note*: Wanted and interfering signal are placed adjacently around F_c				

7.16.2 Requirement for MSR

In-channel selectivity (ICS) is a measure of the receiver ability to receive a wanted signal at its assigned resource block locations in the presence of an interfering signal received at a larger power spectral density. ICS is only applied for E-UTRA BS and it is a BS class dependent requirement. In MSR specification, ICS is referred in corresponding subclause 7.4 of TS 36.104, which would include the requirements for MR BS.

There is no need to change current MSR specification for ICS requirement.

8 RF requirements for Local Area BS

8.1 Void

8.2 Base station output power

In E-UTRA LA BS co-existence study the maximum output power is defined per carrier 3GPP TR 36.931 [8]. In UTRA LA BS specification, it limits the maximum power for each carrier at each antenna connector 3GPP TS 25.104 [2]. For MSR LA BS, the rated carrier output power is aligned with UTRA LA BS rated output power requirement. The limit is set to ≤24dBm per carrier per antenna port.

It should be noted that the requirement does not mandate a single specific output power, since it only defines the Base Station maximum output power declaration, not the power the Base Station must transmit at. In reality the output power of the Base Station can be configured by the operator to ensure system performance and coexistence.

8.3 Frequency error

Frequency error is a measure of the difference between the actual BS transmit frequency and the assigned frequency. The same source shall be used for RF frequency and data clock generation.

Similar with the methodology of defining MSR WA BS frequency error requirement, the frequency error requirement for MSR LA BS will be referred to the single RAT requirements for each RAT. No change is needed for TS 37.104.

8.4 Spurious emissions (additional)

There are four requirements defined for transmitter spurious emission in TS37.104: The mandatory requirements, Protection of the BS receiver of own or different BS, Additional spurious emissions, and Co-location with other base stations. BS should meet specific spurious emission requirements under specific deployment scenario.

The mandatory requirements for Category A and B are defined according to the ITU-R recommendation SM.329 and are independent of the type of transmitter considered. Thus it shall remain unchanged.

The limits for additional spurious emission requirement are used for protection of specific equipment when co-existing with systems operating in other frequency bands and is independent of BS class, except for the specific requirement for Home BS, which is based on a very different scenario. The requirements thus remain unchanged.

For Protection of the BS receiver of own or different BS and Co-location with other base station, the requirements are based on 0.8dB noise rise principle, which has relationship with receiver Noise Figure of UTRA and E-UTRA Pico BS. MSR LA spurious emission should align with the stringent one since the requirements are band specific. The LA BS limits (measured in 100 kHz) are set to -88 dBm, being the most restrictive of -88 dBm (from E-UTRA) and -82 dBm (from UTRA).

For co-location with GSM systems, the MSR BS spurious emission limits will be the same as used in the GERAN specifications for LA multicarrier BTS.

8.5 Operating band unwanted emissions

The UEM is implicitly defined in TS25.104, scaling with the BS maximum output power. The UEM values keep constant when BS maximum output power less than 31dBm, thus for the maximum output power of LA BS class is of 24dBm, the UEM values with P<31 dBm will be applied. In TS36.104, the LA UEM values are all the same to for category A and B, scaling with the bandwidth. For LA MSR BC1, the UEM values for LA MSR should be taken as the strictest values between UTRA and E-UTRA requirement by adopting the same principle of WA MSR.

By comparing the LA UEM values between E-UTRA and UTRA , we can see that the UEM values of LA E-UTRA bandwidth ≥5MHz are stricter than the LA UTRA UEM values. Thus it is suggested to adopt the LA E-UTRA bandwidth≥5MHz UEM values (table 6.6.3.2A in TS36.104) for LA MSR BC1 UEM values.

For LA MSR BC2, the LA MSR BC1 UEM values are adopted for the baseline level of LA MSR BC2 by using the same principle of WA MSR. Additionally the scenarios where a GSM carrier is placed as close as 200KHz from the RF bandwidth edge should be considered. Comparing the values between the LA UEM E-UTRA bandwidth ≥ 5MHz and the LA GSM mask (with the maximum output power for Local Area Multicarrier BTS class of 24dBm), we can see that for the first ~170KHz, the GSM modulation spectrum will exceed the LA E-UTRA bandwidth ≥5MHz mask level. Thus for LA MSR operation with a GSM/EDGE or E-UTRA 1.4 or 3 MHz carriers adjacent to the RF bandwidth edge, the GSM mask with the maximum output power Local Area Multicarrier BTS class is 24dBm will apply for 0MHz~0.17MHz.

8.6 ACLR

Adjacent Channel Leakage power Ratio (ACLR) is defined as the ratio of the filtered mean power centred on the assigned channel frequency to the filtered mean power centred on an adjacent channel frequency. This requirement applies to frequency ranges outside the Base Station RF bandwidth.

The ACLR limits for MSR Wide Area BS are referred back to the existing single-RAT ACLR requirements, thus the same methodology of defining ACLR for MSR WA BS can be applied to MSR LA BS as well. No change is needed for TS 37.104 for introduction of MSR LA BS.

The relative part of the CACLR requirement is independent on BS class, thus no change is needed for TS37.104 for introduction of MSR LA BS. For the absolute requirement part of CACLR, the E-UTRA LA BS absolute limit for ACLR (-32dBm/MHz) can be adopted for MSR LA BS.

8.7 Transmitter intermodulation

The TX intermodulation requirement is a measure of the capability of the transmitter to inhibit the generation of signals in its non linear elements caused by presence of the own transmit signal and an interfering signal reaching the transmitter via the antenna.

The Tx intermodulation requirement is based on reference to the respective unwanted emission limits which are BS class specific. The interferers injected into the transmitter are an E-UTRA carrier of 5MHz bandwidth (BC1 and BC2) or a CW signal at lower offsets (BC2), both with a power level of 30 dB below wanted signal. Based on the analysis, the current TS 37.104 will not be affected for introduction of MSR LA BS.

8.8 Reference sensitivity

The reference sensitivity power level PREFSENS is the minimum mean power received at the antenna connector at which a reference performance requirement shall be met for a specified reference measurement channel. The primary purpose of defining this requirement is to verify the receiver noise figure.

In the same way as for the existing MSR Wide Area (general purpose) BS class, MSR LA BS reference sensitivity will be covered by reference to the corresponding single RAT specifications for each RAT. No change is needed for TS 37.104.

8.9 Receiver dynamic range

The rationale for and definition of the dynamic range requirements are very RAT specific and single RAT specifications are referenced for MSR WA BS in current TS37.104. Therefore Rx dynamic range requirement for MSR LA BS could be referred back to each single RAT specification as well. No changes are needed for current TS37.104 due to introduction of MSR LA BS class.

8.10 In-band blocking

The in-blocking characteristics are a measure of the receiver ability to receive a wanted signal at its assigned channel frequency in the presence of an unwanted interferer.

For UTRA LA BS, the general in-band blocking requirement is based on a UTRA interfering signal with mean power of -30dBm and 7.5MHz minimum offset from the channel edge of the wanted signal.

For E-UTRA LA BS, the blocking requirement is based on an E-UTRA interfering signal with mean power of -35dBm. The minimum offset from the channel edge of the wanted signal is dependent on the E-UTRA channel bandwidth and is equal to 1.5 times of E-UTRA channel bandwidth.

A receiver requirement is more stringent when the difference between the blocker level and associated noise level is higher. UTRA and E-UTRA LA receiver requirements cannot be easily compared as different noise levels are considered for UTRA and E-UTRA reference sensitivity requirements. Reference sensitivity level difference between Wide Area and Local Area BSs is equal to 14 and 8 dB for UTRA and E-UTRA, respectively. Therefore, even though the UTRA interfering signal is 5dB stronger than the E-UTRA one, the E-UTRA requirement is more stringent than the UTRA one as the noise level difference between UTRA and E-UTRA is 6dB.

In order to maintain the requirement level of both UTRA and E-UTRA for MSR BS, the stronger interfering signal is selected for LA MSR BS, with the blocking requirement based on the UTRA interfering signal mean power of -30dBm.In order to maintain a reasonable implementation complexity and create the same difference between the blocker level and the associated noise level for E-UTRA in the single-RAT and MSR specifications, the wanted signal mean power is consequently increased by 5 dB for the E-UTRA MSR requirement.

8.11 Narrowband blocking

The narrow band 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 narrow band interferer close to the wanted signal.

For UTRA LA BS, the narrow band blocking requirement is based on a GMSK modulated signal with the mean power of -37dBm. The interfering signal is specified with 2.7MHz or 2.8MHz offsets from the center frequency of the wanted signal.

For E-UTRA LA BS, the narrow band blocking requirement is based on an E-UTRA interfering signal which concentrates total power on one RB with mean power of -41dBm and different frequency positions offsets from the RF bandwidth edge.

Receiver requirement is more stringent when the difference between the blocker level and associated noise level is higher. UTRA and E-UTRA LA receiver requirements cannot be easily compared as different noise levels are considered for UTRA and E-UTRA reference sensitivity requirements. Reference sensitivity level difference between Wide Area and Local Area BSs is equal to 14 and 8 dB for UTRA and E-UTRA, respectively. Therefore, even though the UTRA interfering signal is 4dB stricter than the E-UTRA one, E-UTRA requirement is more stringent than the UTRA one as the noise level difference between UTRA and E-UTRA is 6dB. Furthermore, the E-UTRA interfering signal is more stringent than the UTRA interfering signal due to PAPR being higher than for a GMSK modulated signal. Taking into account the methodology of defining MSR WA BS narrowband blocking requirement, the narrowband blocking requirement for MSR LA BS is derived from the most stringent requirement from UTRA and E-UTRA specifications. The requirement is thus based on E-UTRA interfering signal with the mean power of -41dBm and the same frequency offsets from the RF bandwidth edge as used in WA BS.

8.12 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. For MSR BS (UTRA and E-UTRA), the selectivity in the adjacent channel is fully verified by the narrowband blocking and there is no separate ACS requirement. This also holds for MSR LA Base Stations. No change is needed for TS 37.104.

8.13 Out-of-band blocking

The out-of-band blocking requirement for MSR BS is in subclause 7.5.1 of 3GPP TS 37.104 [4]. For the LA MSR BS class, the interfering signal mean remains at -15 dBm and is also identical to the level for LA UTRA and LA E-UTRA BS. The existing requirement thus covers also LA MSR BS.

The blocking requirement for MSR BS co-location is in subclause 7.5.2 of 3GPP TS 37.104 [4] and applies for co-location with the BS of the same class. Based on a 24 dBm BS power and 30 dB MCL, a blocking interferer level of -6 dBm is derived and applied for all co-location cases.

The co-location requirements assume co-location with the same base station class. The same limit will then apply for co-location with Local Area GSM multicarrier BTS, since the maximum multicarrier BTS power is 24 dBm. No GSM multicarrier margin will be needed since the maximum power is defined over all carriers.

8.14 Receiver spurious emissions

The receiver spurious emissions power is the power of emissions generated or amplified in a receiver that appear at the BS receiver antenna connector. The requirements apply to all BS with separate RX and TX antenna ports. In this case for FDD BS the test shall be performed when both TX and RX are on, with the TX port terminated.

Spurious emissions include general requirement based on CEPT/ERC/Recommendation 74-01E [9] and additional requirements for co-existence and co-location based on the corresponding TX spurious limits. The general spurious emission is a BS class independent requirement. The additional requirements for receiver spurious emission in the MSR specification are referenced to clause 6.

Therefore, no change for Rx spurious emissions is needed for TS 37.104 for introduction of MSR Pico.

8.15 Receiver intermodulation

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 receive a wanted signal on its assigned channel frequency in the presence of two interfering signals which have a specific frequency relationship to the wanted signal.

For UTRA LA BS, the general intermodulation requirement is based on a CW signal and a WCDMA signal with mean power of -38dBm, while the RX narrow band intermodulation requirement is based on a CW signal and GMSK modulated signal with mean power of -37dBm.

For E-UTRA LA BS, the general intermodulation requirement is based on a CW signal and an E-UTRA signal with mean power of -44dBm, while the narrow band intermodulation requirement is based on a CW signal and an E-UTRA signal with mean power of -44dBm on one RB.

Receiver requirement is more stringent when the difference between the interfering signal level and associated noise level is higher. UTRA and E-UTRA LA receiver requirements cannot be easily compared as different noise levels are considered for UTRA and E-UTRA reference sensitivity requirements. Reference sensitivity level difference between Wide Area and Local Area BSs is equal to 14 and 8 dB for UTRA and E-UTRA, respectively. Therefore, even though the UTRA interfering signal is 6dB stricter for the general intermodulation requirement and 7dB stricter for the narrow band intermodulation requirement than the E-UTRA one, E-UTRA requirement is comparable to UTRA one as the noise level difference between UTRA and E-UTRA is 6dB. Furthermore, for the narrowband intermodulation requirement, the E-UTRA interfering signal is more stringent than WCDMA signal and GMSK modulated signal due to higher PAPR.

Taking into account that the UTRA and E-UTRA requirements are similar and in order to align the type of the interfering signal between Wide Area and Local Area, the intermodulation requirement is on the basis of the E-UTRA specification, but with the stronger interfering signal mean power of -38dBm taken from the UTRA specification, in order to maintain the requirement level of both UTRA and E-UTRA for MSR BS. In order to maintain a reasonable implementation complexity and create the same difference between the interferer levels and the associated intermodulation level for E-UTRA in the single-RAT and MSR specifications, the wanted signal mean power in is consequently increased by 6 dB for the E-UTRA MSR requirement.

Similar as for the MSR WA BS narrowband intermodulation requirement, MSR LA BS narrowband requirement is derived from the most stringent requirement from UTRA and E-UTRA specifications and is thus based on the current E-UTRA LA requirement.

8.16 In-channel selectivity

In-channel selectivity (ICS) is a measure of the receiver ability to receive a wanted signal at its assigned resource block locations in the presence of an interfering signal received at a larger power spectral density. ICS is only applied for E-UTRA BS and it is a BS class dependent requirement. In MSR specification, ICS is referred in corresponding subclause 7.4 of TS 36.104, which already includes the requirements for MSR LA BS. No change is needed for TS 37.104 due to introduction of MSR LA BS.

9 Demodulation performance for Medium Range BS

Due to the extensive power range of MR E-UTRA BS (i.e. 24 ~ 38dBm), it is expected that not only MR E-UTRA BS can be used as micro cells which are isolated from other micro cells and overlapped with larger macro cells, but also MR E-UTRA BS themselves can be used as macro cells although whose cell radius would be slightly smaller than that of WA E-UTRA BS. Considering these possible scenarios of MR E-UTRA BS, it would be better to discuss the demodulation performance requirement of MR E-UTRA BS based on both requirements of WA E-UTRA BS and LA E-UTRA BS. Although the only LA E-UTRA BS specific requirements are low Doppler speed scenarios in Section 8.2.4 and 8.3.3 of 3GPP TS 36.104 [3], for MR E-UTRA BS, it is desirable to meet the high Doppler speed scenarios rather than to tune to low Doppler speed scenarios considering BS implementation. And MR E-UTRA BS are expected to be used also under the high speed train propagation condition, thus the optional performance requirement for high speed train condition are needed to be specified also for MR E-UTRA BS. Therefore, it can be concluded that the same demodulation requirements to WA E-UTRA BS are enough to be specified as the demodulation requirements of MR E-UTRA BS.

Annex A: Void

Annex B:
Void

Annex C: Simulation Results

C.1 Reference sensitivity

The reference sensitivity power level $P_{REFSENS}$ is the minimum mean power received at the antenna connector at which a throughput requirement shall be met for a specified reference measurement channel. In this section the simulation results for Reference sensitivity from different companies have be captured based on the simulation scenarios/assumptions in section 6.

C.1.1 Coexistence simulation results in E1a scenario

Simulations are based on the following assumptions:

Aggressor system: 10 MHz E-UTRA Micro

Victim system: 10 MHz E-UTRA Micro

Simulation frequency: 2000 MHz

Environment: Micro Cell, Urban Area, uncoordinated deployment

ISD: Manhattan grid

Simulation results are presented in table C.1.1-1 to C.1.1-4.

Table C.1.1-1: 5%-ile relative throughput in E1a scenario for PC1

Noise floor (dBm)	Huawei (R4-121606)	Ericsson	NSN	CATT	ZTE (R4-122297)	ALU (R4-12xxxx)
-102						0.9924
-101						
-100						0.9923
-99	0.9978				0.9848	
-98						0.9922
-97	0.998				0.9843	
-96						0.9921
-95	0.9979				0.9843	
-94						0.9921
-93	0.998				0.984	
-92						
-91	0.998				0.9845	
-90						
-89					0.9845	
-88						
-87					0.9845	

Table C.1.1-2: Average relative throughput in E1a scenario for PC1

Noise floor (dBm)	Huawei (R4-121606)	Ericsson (R4-123083)	NSN	CATT	ZTE (R4-122297)	ALU (R4-123711)
-102						0.9879
-101						
-100						0.9863
-99	0.986	0.995			0.9964	
-98						0.9847
-97	0.9859				0.9963	
-96						0.9834
-95	0.986	0.9941			0.9963	
-94						0.9832
-93	0.9858				0.9962	
-92						
-91	0.986	0.9945			0.9962	
-90						
-89					0.9962	
-88						
-87		0.9938			0.9962	
-86						
-85						
-84						
-83		0.994				

Table C.1.1-3: 5%-ile relative throughput in E1a scenario for PC2

Noise floor (dBm)	Huawei	Ericsson	NSN	CATT	ZTE	ALU (R4-123711)
-101						0.997
-97						0.997
-93						0.9957
-89						0.9979
-85						0.9956

Table C.1.1-4: Average relative throughput in E1a scenario for PC2

Noise floor (dBm)	Huawei	Ericsson	NSN	CATT	ZTE	ALU (R4-123711)
-101						0.9983
-97						0.9966
-93						0.9943
-89						0.9917
-85						0.9892

C.1.2 Coexistence simulation results in U1a scenario

Simulations are based on the following assumptions:

Aggressor system: 10 MHz E-UTRA Micro

Victim system: 10 MHz UTRA Micro

Simulation frequency: 2000 MHz

Environment: Micro Cell, Urban Area, uncoordinated deployment

ISD: Manhattan grid

Simulation results are presented in table C.2.1-1.

Table C.2.1-1: Relative capacity in U1a scenario

Noise floor (dBm)	Huawei (R4-121606)	Ericsson	NSN	CATT	ZTE	ALU
-103	1					
-99	0.978					
-97	0.978					
-95	0.93					
-93	0.905					
-91	0.86					

C.1.3 Coexistence simulation results in E1b-1 scenario

Simulations are based on the following assumptions:

Aggressor system: 10 MHz E-UTRA Micro

Victim system: 10 MHz E-UTRA Macro

Simulation frequency: 2000 MHz

Environment: Micro Cell / Macro Cell, Urban Area, coordinated deployment

ISD: Manhattan grid / 500m

Simulation results are presented in table C.1.3-1 to C.1.3-7.

Table C.1.3-1: 5%-ile relative throughput in E1b-1 scenario for PC1/PC3

Noise floor (dBm)	Huawei (R4-120161)	Ericsson	NSN (R4-121817)	CATT (R4-121502)	ZTE (R4-122297)	ALU (R4-123711)
-102						1
-101						
-100						0.99995
-99	0.999		0.995	1	0.9942	
-98						0.9999
-97	0.9985		0.992	0.999	0.9924	
-96						0.99985
-95	0.998		0.987	0.998	0.9898	
-94						0.9998
-93	0.9965		0.983	0.99	0.9856	
-92						
-91	0.9945		0.975	0.98	0.9794	
-90						
-89				0.97	0.9703	
-88						
-87				0.955	0.9575	
-86						
-85				0.93		

Table C.1.3-2: Average relative throughput in E1b-1 scenario for PC1/PC3

Noise floor (dBm)	Huawei (R4-120161)	Ericsson (R4-123098)	NSN (R4-121817)	CATT (R4-121502)	ZTE (R4-122297)	ALU (R4-123711)
-102						0.999
-101						
-100						0.9982
-99	0.9999	0.996	0.997	0.995	0.9976	
-98						0.9972
-97	0.9998		0.995	0.985	0.997	
-96						0.9958
-95	0.9997	0.991	0.992	0.98	0.9961	
-94						0.9935
-93	0.9995		0.987	0.975	0.9948	
-92						
-91	0.9991	0.984	0.98	0.965	0.993	
-90						
-89				0.955	0.9904	
-88						
-87		0.97		0.94	0.9887	
-86						
-85				0.93		
-84						
-83		0.942				

Table C.1.3-3: 5%-ile relative throughput in E1b-1 scenario for PC2/PC2

Noise floor (dBm)	Huawei (R4-120161)	Ericsson	NSN	CATT	ZTE	ALU (R4-123711)
-103	0.9995					
-101						1
-99	0.9988					
-97	0.998					1
-95	0.997					
-93	0.995					0.9995
-91	0.9922					
-89						0.9994
-87						
-85						0.9993

Table C.1.3-4: Average relative throughput in E1b-1 scenario for PC2/PC2

Noise floor (dBm)	Huawei (R4-120161)	Ericsson (R4-123083)	NSN	CATT	ZTE	ALU (R4-123711)
-103	1					
-101						0.9998
-99	0.9998	0.997				
-97	0.9995					0.9997
-95	0.9992	0.992				
-93	0.999					0.999
-91	0.9982	0.985				
-89						0.998
-87		0.971				
-85						0.995
-83		0.949				

Table C.1.3-5: 5%-ile relative throughput in E1b-1 scenario for PC2/PC3

Noise floor (dBm)	Huawei (R4-120161)	Ericsson	NSN (R4-121817)	CATT	ZTE	ALU (R4-123711)
103	0.998		0.998			
-102						0.9995
-101						
-100						0.9993
-99	0.995		0.995			
-98						0.999
-97	0.993		0.993			
-96						0.988
-95	0.99		0.99			
-94						0.98
-93	0.984		0.985			
-92						
-91	0.975		0.978			

Table C.1.3-6: Average relative throughput in E1b-1 scenario for PC2/PC3

Noise floor (dBm)	Huawei (R4-120161)	Ericsson (R4-123098)	NSN (R4-121817)	CATT	ZTE	ALU (R4-123711)
103	**1**		**0.998**			
-102						**0.996**
-101						
-100						**0.993**
-99	**0.999**	**0.96**	**0.995**			
-98						**0.99**
-97	**0.998**		**0.993**			
-96						**0.985**
-95	**0.997**	**0.925**	**0.99**			
-94						**0.98**
-93	**0.996**		**0.985**			
-92						
-91	**0.995**	**0.86**	**0.975**			
-90						
-89						
-88						
-87		**0.78**				
-86						
-85						
-84						
-83		**0.68**				

Table C.1.3-7: Average relative throughput in E1b-1 scenario for PC1/PC1

Noise floor (dBm)	Huawei	Ericsson (R4-123083)	NSN	CATT	ZTE	ALU
-99		0.997				
-95		0.99				
-91		0.983				
-87		0.97				
-83		0.942				

C.1.4 Coexistence simulation results in E1b-2 scenario

Simulations are based on the following assumptions:

Aggressor system: 10 MHz E-UTRA Micro

Victim system: 10 MHz E-UTRA Macro

Simulation frequency: 2000 MHz

Environment: Micro Cell / Macro Cell, Urban Area, coordinated deployment

ISD: Manhattan grid / 1732m

Simulation results are presented in table C.1.4-1-C.1.4-7.

Table C.1.4-1: 5%-ile relative throughput in E1b-2 scenario for PC1/PC3

Noise floor (dBm)	Huawei (R4-120161)	Ericsson	NSN (R4-121817)	CATT (R4-121502)	ZTE	ALU (R4-123711)
-102						1
-101						
-100						0.9999
-99	0.9985		0.996	0.98		
-98						0.9998
-97	0.9978		0.994	0.975		
-96						0.9976
-95	0.9965		0.992	0.97		
-94						0.994
-93	0.995		0.988	0.96		
-92						
-91	0.9928		0.982	0.95		
-90						
-89				0.94		
-88						
-87				0.91		
-86						
-85				0.89		

Table C.1.4-2: Average relative throughput in E1b-2 scenario for PC1/PC3

Noise floor (dBm)	Huawei (R4-120161)	Ericsson (R4-123098)	NSN (R4-121817)	CATT (R4-121502)	ZTE	ALU (R4-123711)
-102						0.9982
-101						
-100						0.9978
-99	0.999	0.9825	0.9985	0.995		
-98						0.9963
-97	0.998		0.9975	0.99		
-96						0.995
-95	0.9972	0.975	0.9965	0.985		
-94						0.992
-93	0.996		0.9955	0.98		
-92						
-91	0.9958	0.9652	0.994	0.97		
-90						
-89				0.96		
-88						
-87		0.952		0.95		
-86						
-85				0.94		

Table C.1.4-3: 5%-ile relative throughput in E1b-2 scenario for PC2/PC2

Noise floor (dBm)	Huawei (R4-120161)	Ericsson	NSN	CATT	ZTE	ALU (R4-123711)
-101						1
-99	0.9978					
-97	0.996					1
-95	0.994					
-93	0.991					1
-91	0.986					
-89						1
-87						
-85						0.9928

Table C.1.4-4: Average relative throughput in E1b-2 scenario for PC2/PC2

Noise floor (dBm)	Huawei (R4-120161)	Ericsson (R4-123083)	NSN	CATT	ZTE	ALU (R4-123711)
-103	1					
-101						0.9998
-99	0.9995	0.982				
-97	0.9988					0.9994
-95	0.998	0.97				
-93	0.9975					0.9989
-91	0.996	0.958				
-89						0.9972
-87		0.93				
-85						0.9932

Table C.1.4-5: 5%-ile relative throughput in E1b-2 scenario for PC2/PC3

Noise floor (dBm)	Huawei (R4-120161)	Ericsson	NSN (R4-121817)	CATT	ZTE (R4-122297)	ALU (R4-123711)
-102						0.992
-101						
-100						0.978
-99	0.991		0.99		0.9813	
-98						0.968
-97	0.987		0.987		0.9738	
-96						0.948
-95	0.98		0.98		0.9663	
-94						0.938
-93	0.97		0.97		0.9559	
-92						
-91	0.957		0.95		0.9389	
-90						
-89					0.9158	
-88						
-87					0.8868	

Table C.1.4-6: Average relative throughput in E1b-2 scenario for PC2/PC3

Noise floor (dBm)	Huawei (R4-120161)	Ericsson	NSN (R4-121817)	CATT	ZTE (R4-122297)	ALU (R4-123711)
-102						0.994
-101						
-100						0.991
-99	0.997		0.998		0.9933	
-98						0.988
-97	0.996		0.997		0.9912	
-96						0.98
-95	0.994		0.995		0.9888	
-94						0.97
-93	0.978		0.992		0.9854	
-92						
-91	0.967		0.99		0.9809	
-90						
-89					0.9748	
-88						
-87					0.9668	

Table C.1.4-7: Average relative throughput in E1b-2 scenario for PC1/PC1

Noise floor (dBm)	Huawei	Ericsson (R4-123083)	NSN	CATT	ZTE	ALU
-99		0.982				
-95		0.975				
-91		0.967				
-87		0.951				

C.1.5 Coexistence simulation results in U1b-1 scenario

Simulations are based on the following assumptions:

Aggressor system: 10 MHz E-UTRA Micro

Victim system: 10 MHz UTRA Macro

Simulation frequency: 2000 MHz

Environment: Micro Cell / Urban Area, coordinated deployment

ISD: Manhattan grid / 500m

Simulation results are presented in table C.1.5-1 and C.1.5-2.

Table C.1.5-1: Relative capacity in U1b-1 scenario for PC3

Noise floor (dBm)	Huawei (R4-120161)	Ericsson (R4-123130)	NSN	CATT	ZTE	ALU (R4-123711)
-102						0.972
-101						
-100						0.964
-99	0.99	0.992				
-98						0.946
-97	0.97	0.994				
-96						0.91
-95	0.953	0.983				
-94						0.84
-93	0.948	0.995				
-92						
-91	0.93	0.986				
-90						
-89		0.982				

Table C.1.5-2: Relative capacity in U1b-1 scenario for PC2

Noise floor (dBm)	Huawei (R4-120161)	Ericsson	NSN	CATT	ZTE	ALU (R4-123711)
-103	1					
-101						1
-99	1					
-97	1					0.998
-95	1					
-93	0.988					0.995
-91	0.952					
-89						0.98
-87						
-85						0.963

C.1.6 Coexistence simulation results in U1b-2 scenario

Simulations are based on the following assumptions:

Aggressor system: 10 MHz E-UTRA Micro

Victim system: 10 MHz UTRA Macro

Simulation frequency: 2000 MHz

Environment: Micro Cell / Macro Cell, Urban Area, coordinated deployment

ISD: Manhattan grid/1732m

Simulation results are presented in table C.1.6-1 to C.1.6-2.

Table C.1.6-1: Relative capacity in U1b-2 scenario for PC3

Noise floor (dBm)	Huawei (R4-120161)	Ericsson (R4-123130)	NSN	CATT	ZTE	ALU (R4-123711)
-102						0.98
-101						
-100						0.975
-99	0.99	0.988				
-98						0.95
-97	0.97	0.9946				
-96						0.93
-95	0.95	0.989				
-94						0.88
-93	0.948	0.987				
-92						
-91	0.922	0.99				
-90						
-89		0.986				

Table C.1.6-2: Relative capacity in U1b-2 scenario for PC2

Noise floor (dBm)	Huawei (R4-120161)	Ericsson	NSN	CATT	ZTE	ALU (R4-123711)
-103	1					
-101						0.999
-99	1					
-97	1					0.998
-95	1					
-93	0.982					0.995
-91	0.952					
-89						0.99
-87						
-85						0.98

C.2 In-band Blocking

The in-band blocking characteristic is a measure of the receiver's ability to detect a wanted signal at its assigned channel in the presence of an unwanted interferer inside the operating band. In this section the simulation results for in-band blocking from different companies have been captured based on the simulation scenarios and assumptions in section 6.

C.2.1 Coexistence simulation results in E2a scenario

Simulations are based on the following assumptions:

Aggressor system: 10 MHz E-UTRA Micro

Victim system: 10 MHz E-UTRA Micro

Simulation frequency: 2000 MHz

Environment: Micro Cell, Urban Area, uncoordinated deployment

ISD: Manhattan grid

Table C.2.1-1: E2a Blocking level for a 99.98% probability

Power Control	NSN (R4-121814)	ZTE (R4-121326)	CATT (R4-121272)	Huawei (R4-120154)	Ericsson (R4-123089)	Alcatel-Lucent (R4-123710)
PC1	-54.2 dBm	--	-48 dBm	-56.96 dBm	- 54 dBm	- 51.9 dBm
PC2	-62.5 dBm	--	--	-64.84dBm	- 63 dBm	- 61.8 dBm

C.2.2 Coexistence simulation results in E2b-1 scenario

Simulations are based on the following assumptions:

Aggressor system: 10 MHz E-UTRA Macro

Victim system: 10 MHz E-UTRA Micro

Simulation frequency: 2000 MHz

Environment: Micro Cell & Macro Cell, Urban Area, coordinated deployment

ISD: Manhattan grid & 500m

Table C.2.2-1: E2b-1 Blocking level for a 99.98% probability

Power Control	NSN (R4-121814)	ZTE (R4-121326)	CATT (R4-121272)	Huawei (R4-122438)	Ericsson (R4-123089)	Alcatel-Lucent (R4-123710)
PC1	-36.5 dBm	--	-42	-36.52dBm	- 34.5 dBm	- 31.2 dBm
PC2	-48.5 dBm	--		-48.82dBm	- 41 dBm	- 43.7 dBm

C.2.3 Coexistence simulation results in E2b-2 scenario

Simulations are based on the following assumptions:

Aggressor system: 10 MHz E-UTRA Macro

Victim system: 10 MHz E-UTRA Micro

Simulation frequency: 2000 MHz

Environment: Micro Cell / Macro Cell, Urban Area, coordinated deployment

ISD: Manhattan grid / 1732m

Table C.2.3-1: E2b-2 Blocking level for a 99.98% probability

Power Control	NSN (R4-121814)	ZTE (R4-121326)	CATT (R4-121272)	Huawei (R4-122438)	Ericsson (R4-123089)	Alcatel-Lucent (R4-123710)
PC1	-31 dBm	-37.31dBm	-34 dBm	-30.0dBm	- 34.5 dBm	- 30 dBm
PC2	-31 dBm	-36.59dBm		-37.32dBm	--	- 30.1 dBm

C.2.4 Coexistence simulation results in U1b-1 scenario

Simulations are based on the following assumptions:

Aggressor system: UTRA Macro

Victim system: 10 MHz E-UTRA Micro

Simulation frequency: 2000 MHz

Environment: Micro Cell / Macro Cell, Urban Area, coordinated deployment

ISD: Manhattan grid / 500m

Table C.2.4-1: U1b-1 Blocking level for a 99.98% probability

Power Control	Alcatel-Lucent (R4-123710)
PC1	- 50.8 dBm
PC2	- 50.9 dBm

C.2.5 Coexistence simulation results in U1b-2 scenario

Simulations are based on the following assumptions:

Aggressor system: UTRA Macro

Victim system: 10 MHz E-UTRA Micro

Simulation frequency: 2000 MHz

Environment: Micro Cell / Macro Cell, Urban Area, coordinated deployment

ISD: Manhattan grid / 1732m

Table C.2.5-1: U1b-2 Blocking level for a 99.98% probability

Power Control	Alcatel-Lucent (R4-123710)
PC1	- 40 dBm
PC2	- 40.1 dBm

Annex D: Change history

Change history							
Date	**TSG #**	**TSG Doc.**	**CR**	**Rev**	**Subject/Comment**	**Old**	**New**
2011-10	R4#60bis	R4-115137			Report skeleton		0.0.1
2011-11	R4#61	R4-115812			Update and correction of report skeleton	0.0.1	0.0.2
2011-11	R4#61	R4-116286			Agreed Text Proposals in RAN4 #61: **R4-115813**, "TP for BS classes Work Item objective" **R4-115819**, "TP for MR BS Spurious emissions" **R4-115820**, "TP for MR BS Frequency error" **R4-116272**, "TP for introducing BS class definitions" **R4-116288**, "TP for MR ACLR" **R4-116289**, "TP for MR Tx Intermodulation"	0.0.2	0.1.0
2012-02	R4#62	R4-121052			Agreed Text Proposals in RAN4 #61: **R4-120158**, "TP on Tx spurious emission requirement for MR BS" **R4-121055**, "TP for Medium Range BS class simulation assumptions and scenarios" **R4-121056**, "TP for MR E-UTRA BS ACLR absolute limit" **R4-121064**, "TP on Rx spurious emissions for MR BS"	0.1.0	0.2.0
2012-03	R4#62bis	R4-122777			Agreed Text Proposals in RAN4 #62bis: **R4-121527**, "TP on frequency error for MSR Local Area BS" **R4-121541**, "TP on Tx intermodulation for MSR Local Area BS" **R4-121546**, "TP on Reference sensitivity for MSR Local Area BS" **R4-121550**, "TP on Rx dynamic range for MSR Local Area BS" **R4-121571**, "TP on in channel selectivity for MSR Local Area BS" **R4-121583**, "TP on ACS for MSR Local Area BS" **R4-121591**, "TP on Rx spurious emissions for MSR Local Area BS" **R4-121615**, "TP on Tx intermodulation for LTE and MSR MR BS" **R4-121617**, "TP on ACS for MSR MR BS" **R4-121618**, "TP on In Channel Selectivity for MSR MR BS" **R4-121619**, "TP on Rx dynamic range for MSR MR BS" **R4-121696**, "TP Additional MR BS class simulation assumptions and corrections" **R4-122136**, "TP for MR E-UTRA BS Out-of band Blocking requirements" (Ericsson, ZTE, Huawei). **R4-122137**, "TP for MR MSR BS Blocking requirements" (Ericsson, ZTE, Huawei). **R4-122138**, "TP on Rx intermodulation for MSR Local Area BS" (Huawei, Ericsson, Nokia Siemens Networks). **R4-122139**, "TP on narrow band blocking for MSR Local Area BS" (Huawei, Ericsson, Nokia Siemens Networks). **R4-122140**, "TP on ACLR for MSR Local Area BS" (Huawei, Ericsson, ZTE). **R4-122146**, "TP on spurious emissions (additional) for MSR Local Area BS" (Huawei, Ericsson).	0.2.0	0.3.0
2012-05	R4#63				Agreed Text Proposals in RAN4 #63: **R4-123606**, "TP for MR E-UTRA BS In-band Blocking requirement" **R4-123626**, "UL power control for E-UTRA MR BS" **R4-123627**, "TP on Output power for MR BS" **R4-123666**, "TP of medium range BS reference sensitivity"	0.3.0	0.4.0
2012-06	RP#56	RP-120705			Presented to TSG RAN for information.	0.4.0	1.0.0
2012-09	R4#64	R4-124976			Agreed Text Proposals in RAN4 #64: **R4-123861**, "TP on ACS requirement for E-UTRA MR BS" **R4-123862**, "TP on Reference sensitivity requirement for MSR MR BS" **R4-123944**, "TP for E-UTRA MR BS in channel selectivity" **R4-124383**, "TP for MR E-UTRA BS narrowband blocking" **R4-124397**, "TP for MR MSR BS In-band blocking" **R4-124404**, "TP for MR BS blocking limits for co-location with GSM" **R4-124410**, "TP for LA MSR BS Out-of-band blocking limits for co-location" **R4-124413**, "E-UTRA MR BS receiver dynamic range" **R4-124487**, "E-UTRA Medium-Range Receiver Intermodulation Requirement" **R4-124490**, "Medium-Range MSR receiver intermodulation requirement" **R4-124758**, "Summary of MSR MR blocking simulation results" **R4-124838**, "TP for medium range BS reference sensitivity" **R4-124923**, "TP for LA MSR BS operating band unwanted emission mask"	1.0.0	1.1.0

					R4-124924, "TP for MSR LA BS output pow er" **R4-124925**, "TP for MSR LA BS in-band blocking requirement" **R4-124926**, "TP for MSR LA BS receiver intermodulation (general)" **R4-124969**, "TP on E-UTRA Medium Range BS unw anted emission mask" **R4-124970**, "TP for MR MSR BS narrow band blocking"		
2012-10	R4#64bis	R4-125464			Editorial updates before RAN4#64bis.	1.1.0	1.1.1
2012-10	R4#65	R4-126080			Agreed Text Proposal in RAN4 #64: **R4-123818**, "TP for MR E-UTRA BS Demodulation Performance" Agreed Text Proposals in RAN4 #64bis: **R4-125037**, "Text proposal on simulation assumptions and results for E-UTRA Medium Range BS" **R4-125470**, "TP on MR BS Spurious emission limits for co-location" **R4-125473**, "TP on BS classes in GSM/EDGE specifications" **R4-125999**, "TP on MR BS Spurious emission limits for protection of own receiver" **R4-126071**, "TP on UEM requirement for MSR Medium Range BS"	1.1.1	1.2.0
2012-11	R4#65	R4-126850			Updated during RAN4#65. Annex A and B removed.	1.2.0	1.3.0
2012-12	RP#58	RP-121715			Presented to TSG RAN for approval.	1.3.0	2.0.0
2012-12	RP#58				TR Approved by RAN		