ETSI TR 136 903 V8.0.0 (2011-01)

Technical Report

LTE;
Evolved Universal Terrestrial Radio Access (E-UTRA); Derivation of test tolerances for multi-cell Radio Resource Management (RRM) conformance tests
(3GPP TR 36.903 version 8.0.0 Release 8)

Reference
RTR/TSGR-0536903v800

Keywords
LTE

ETSI

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Sous-Préfecture de Grasse (06) N° 7803/88

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Foreword

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Contents

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:

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  - 1 presented to TSG for information;
  - 2 presented to TSG for approval;
  - 3 or greater indicates TSG approved document under change control.
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- z the third digit is incremented when editorial only changes have been incorporated in the document.

Introduction

1 Scope

The present document specifies a general method used to derive Test Tolerances for Radio Resource Management tests, and establishes a system for relating the Test Tolerances to the measurement uncertainties of the Test System.

The test cases which have been analysed to determine Test Tolerances are included as .zip files.

The present document is applicable from Release 8 up to the release indicated on the front page of the present Terminal conformance specifications.

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*.

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[1] 3GPP TR 21.905: "Vocabulary for 3GPP Specifications".

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

[3] 3GPP TS 34.121-1: "Terminal conformance specification, Radio transmission and reception (FDD), Release 8".

[4] 3GPP TS 36.521-1: "User Equipment (UE) conformance specification, Radio transmission and reception Part 1: conformance testing, Release 8".

[5] 3GPP TS 36.521-3: "User Equipment (UE) conformance specification, Radio transmission and reception Part 3: Radio Resource Management (RRM) conformance testing, Release 8".

[6] 3GPP TS 36.141: "E-UTRA Base Station (BS) conformance testing, Release 8"

[7] 3GPP TS 36.211: "E-UTRA Physical Channels and Modulation, Release 8"

3 Definitions, symbols and abbreviations

3.1 Definitions

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

Other definitions used in the present document are listed in 3GPP TS 36.521-3 [5] or 3GPP TS 36.141 [6].

3.2 Symbols

Symbols used in the present document are listed in 3GPP TR 21.905 [1], 3GPP TS 36.521-3 [5] or 3GPP TS 36.141 [6].

3.3 Abbreviations

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

Other abbreviations used in the present document are listed in 3GPP TS 36.521-3 [5] or 3GPP TS 36.141 [6].

4 General Principles

4.1 Principle of Superposition

For multi-cell tests there are several cells each generating various Physical channels. In general cells are combined along with AWGN, so the signal and noise seen by the UE may be determined by more than one cell.

Since several cells may contribute towards the overall power applied to the UE, a number of test system uncertainties affect the signal and noise seen by the UE. The aim of the superposition method is to vary each controllable parameter of the test system separately, and to establish its effect on the critical parameters as seen by the UE receiver. The superposition principle then allows the effect of each test system uncertainty to be added, to calculate the overall effect.

The contributing test system uncertainties shall form a minimum set for the superposition principle to be applicable.

4.2 Sensitivity analysis

A change in any one channel level or channel ratio generated at source does not necessarily have a 1:1 effect at the UE. The effect of each controllable parameter of the test system on the critical parameters as seen by the UE receiver shall therefore be established. As a consequence of the sensitivity scaling factors not necessarily being unity, the test system uncertainties cannot be directly applied as test tolerances to the critical parameters as seen by the UE.

EXAMPLE: In many of the tests described, the $\hat{E}s / I_{ot}$ is one of the critical parameters at the UE. Scaling factors are used to model the sensitivity of the $\hat{E}s / I_{ot}$ to each test system uncertainty. When the scaling factors have been determined, the superposition principle then allows the effect of each test system uncertainty to be added, to give the overall variability in the critical parameters as seen at the UE.

There are often constraints on several parameters at the UE. The aim of the sensitivity analysis, together with the acceptable test system uncertainties, is to ensure that the variability in each of these parameters is controlled within the limits necessary for the specification to apply. The test has then been conducted under valid conditions.

4.3 Statistical combination of uncertainties

The acceptable uncertainties of the test system are specified as the measurement uncertainty tolerance interval for a specific measurement that contains 95 % of the performance of a population of test equipment, in accordance with 3GPP TS 36.521-3 [5] clause F.1. In the RRM tests covered by the present document, the Test System shall enable the stimulus signals in the test case to be adjusted to within the specified range, with an uncertainty not exceeding the specified values.

The method given in the present document combines the acceptable uncertainties of the test system, to give the overall variability in the critical parameters as seen at the UE. Since the process does not add any new uncertainties, the method of combination should be chosen to maintain the same tolerance interval for the combined uncertainty as is already specified for the contributing test system uncertainties.

The basic principle for combining uncertainties is in accordance with ETR 273-1-2 [2]. In summary, the process requires 3 steps:

a) Express the value of each contributing uncertainty as a one standard deviation figure, from knowledge of its numeric value and its distribution.

b) Combine all the one standard deviation figures as root-sum-squares, to give the one standard deviation value for the combined uncertainty.

c) Expand the combined uncertainty by a coverage factor, according to the tolerance interval required.

Provided that the contributing uncertainties have already been obtained using this method, using a coverage factor of 2, further stages of combination can be achieved by performing step b) alone, since steps a) and c) simply divide by 2 and multiply by 2 respectively.

The root-sum-squares method is therefore used to maintain the same tolerance interval for the combined uncertainty as is already specified for the contributing test system uncertainties. In some cases where correlation between contributing uncertainties has an adverse effect, the method is modified in accordance with clause 4.4.5 of the present document.

In each analysis, the uncertainties are assumed to be uncorrelated, and are added result root-sum-square unless otherwise stated.

The combination of uncertainties is performed using dB values for simplicity. It has been shown that using dB uncertainty values gives a slightly worse combined uncertainty result than using linear values for the uncertainties. The analysis method therefore errs on the safe side.

4.4 Correlation between uncertainties

The statistical (root-sum-square) addition of uncertainties is based on the assumption that the uncertainties are independent of each other. For realisable test systems, the uncertainties may not be fully independent. The validity of the method used to add uncertainties depends on both the type of correlation and on the way in which the uncertainties affect the test requirements.

Clauses 4.4.1 to 4.4.3 give examples to illustrate different types of correlation.

Clauses 4.4.4 to 4.4.7 show how the scenarios applicable to multi-cell RRM tests are treated.

4.4.1 Uncorrelated uncertainties

The graph shows an example of two test system uncertainties, A and B, which affect a test requirement. Each sample from a population of test systems has a specific value of error in parameter A, and a specific value of error in parameter B. Each dot on the graph represents a sample from a population of test systems, and is plotted according to its error values for parameters A and B.

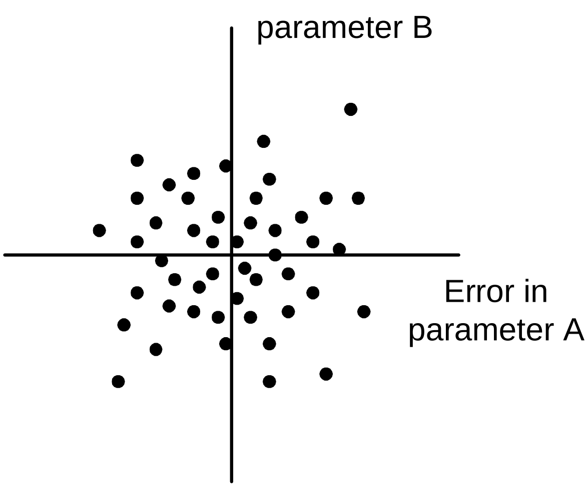

Figure 4.4.1.1: Example of two test system uncertainties affecting a test requirement

It can be seen that a positive value of error in parameter A, for example, is equally likely to occur with either a positive or a negative value of error in parameter B. This is expected when two parameters are uncorrelated, such as two uncertainties which arise from different and unrelated parts of the test system.

4.4.2 Positively correlated uncertainties

The graph shows an example of two test system uncertainties, A and B, which affect a test requirement. Each sample from a population of test systems has a specific value of error in parameter A, and a specific value of error in parameter B. Each dot on the graph represents a sample from a population of test systems, and is plotted according to its error values for parameters A and B.

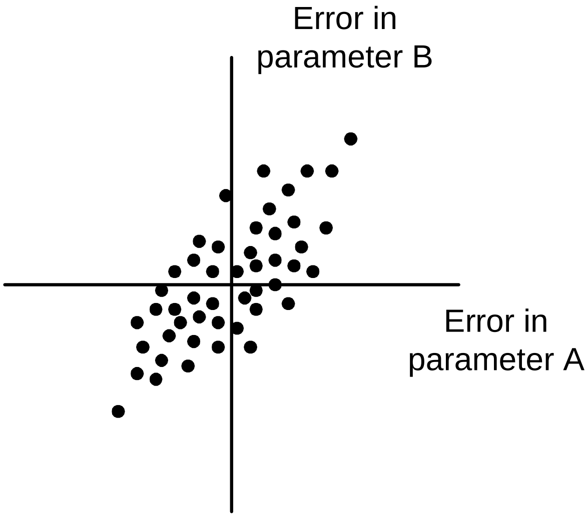

Figure 4.4.2.1: Example of two test system uncertainties affecting a test requirement

It can be seen that a positive value of error in parameter A, for example, is more likely to occur with a positive value of error in parameter B and less likely to occur with a negative value of error in parameter B. This can occur when the two uncertainties arise from similar parts of the test system, or when one component of the uncertainty affects both parameters in a similar way.

In an extreme case, if the error in parameter A and the error in parameter B came from the same sources of uncertainty, and no others, the dots would lie on a straight line of slope +1.

4.4.3 Negatively correlated uncertainties

The graph shows an example of two test system uncertainties, A and B, which affect a test condition. Each sample from a population of test systems has a specific value of error in parameter A, and a specific value of error in parameter B. Each dot on the graph represents a sample from a population of test systems, and is plotted according to its error values for parameters A and B.

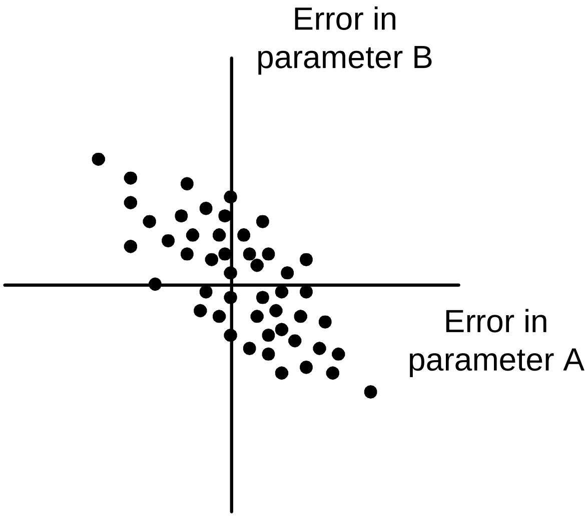

Figure 4.4.3.1: Example of two test system uncertainties affecting a test condition

It can be seen that a positive value of error in parameter A, for example, is more likely to occur with a negative value of error in parameter B and less likely to occur with a positive value of error in parameter B. This effect can theoretically occur, and is included for completeness, but is unlikely in a practical test system.

4.4.4 Treatment of uncorrelated uncertainties

If two uncertainties are uncorrelated, they are added statistically in the analysis. Provided that each uncertainty is already expressed as an expanded uncertainty with coverage factor 2, the contributing uncertainties are added root-sum-squares to give a combined uncertainty which also has coverage factor 2, and the 95% tolerance interval is maintained.

This is the default assumption.

4.4.5 Treatment of positively correlated uncertainties with adverse effect

If two test system uncertainties are positively correlated, and if they affect the value of a critical parameter in the same direction, the combined effect may be greater than predicted by adding the contributing uncertainties root-sum-squares.

In this scenario the two uncertainties are added worst-case in the analysis. Provided that each uncertainty is already expressed as an expanded uncertainty with coverage factor 2, the combined uncertainty will cover a 95% tolerance interval even when the two contributing uncertainties are fully correlated. If the two contributing uncertainties are less than fully correlated, the combined uncertainty will cover a tolerance interval greater than 95%.

4.4.6 Treatment of positively correlated uncertainties with beneficial effect

If two test system uncertainties are positively correlated, and if they affect the value of a critical parameter in opposite directions, the combined effect will be less than predicted by adding the contributing uncertainties root-sum-squares.

In this scenario the two uncertainties are added statistically in the analysis. Provided that each uncertainty is already expressed as an expanded uncertainty with coverage factor 2, the combined uncertainty will cover a 95% tolerance interval when the two contributing uncertainties are uncorrelated. If the two contributing uncertainties are positively correlated, the combined uncertainty will cover a tolerance interval greater than 95%.

4.4.7 Treatment of negatively correlated uncertainties

Negatively correlated uncertainties are excluded by the assumptions. This has been agreed as an acceptable restriction on practical test systems, as the mechanisms which produce correlation generally arise from similarities between two parts of the test system, and therefore produce positive correlation.

5 Grouping of test cases

The Test cases are grouped from the viewpoint of efficiently defining the uncertainties and test tolerances. Tests in the same group generally have the same type of uncertainties, given in more detail in Annex B.

A group of test cases having significant differences from those already listed, in respect of uncertainties and test tolerance analysis, will require a new row in the Table.

Table 5-1: Test case groups for test tolerance analysis

Group	E-UTRA FDD	E-UTRA TDD	E-UTRA FDD/TDD	Inter-RAT		Comments
A	4.2.1 5.1.1 6.1.1 8.1.1 8.1.2 8.1.3	4.2.2 5.1.2 8.2.1 8.2.2				Two cell LTE intra 2 or 3 time periods Various number of sub-tests Some tests have fading
B	4.2.3 5.1.3 6.1.2 8.3.1 8.3.2 5.1.5 8.3.3	4.2.6 5.1.4 5.1.6 8.4.1 8.4.2 8.11.2				Two cell LTE inter 2 or 3 time periods Some tests have fading
C	9.1.1.1 9.1.1.2 9.2.1.1	9.1.2.1 9.1.2.2 9.2.2.1				Two cell LTE intra 3 sub-tests RSRP, RSRQ
D	9.1.3.1 9.1.3.2 9.2.3.1 9.2.3.2	9.1.4.1 9.1.4.2 9.2.4.1 9.2.4.2				Two cell LTE inter 2 or 3 sub-tests RSRP, RSRQ
E	6.2.1 6.2.2	6.2.3 6.2.4				One cell LTE 1 time period Various number of sub-tests Level, timing
F	7.1.1 7.2.1	7.1.2 7.2.2				One cell LTE Various number of time periods Various number of sub-tests Timing only
G	7.3.1 7.3.2 7.3.5 7.3.6	7.3.3 7.3.4 7.3.7 7.3.8				One cell LTE Various number of time periods Various number of sub-tests

6 Determination of Test System Uncertainties

6.1 General

The uncertainty of a test system when making measurements reduces the ability of the test system to distinguish between conformant and non-conformant test subjects. The aim is therefore to minimise uncertainty, subject to a number of practical constraints:

a) A vendor"s test system should be reproducible in the required quantities.

b) A choice of test systems should be available from different vendors.

c) The uncertainties should allow reasonable freedom of test system implementation

d) The test system can be run automatically

e) The test system may include several radio access technologies

f) It should be possible to maintain calibration of deployed test systems over reasonable spans of time and environmental conditions

In practice therefore within 3GPP the acceptable uncertainty of the test system is the smallest value that can be agreed between the test system vendors represented, consistent with the above constraints. The uncertainty will not therefore be as low as could be achieved, for example, by a national standards laboratory.

6.2 Uncertainty figures

The actual figures for the acceptable uncertainty of a test system are defined in Annex F of 36.521-3 [5]. To avoid maintenance issues with figures in separate specifications, the uncertainties are not formally defined within the present document, but informative guidelines are provided in Annex B.

In many cases the default uncertainties in Annex B of the present document are the same as used for UTRA in TS 34.121-1 [3] to allow similar calibration methods to be used. Where E-UTRA has different requirements, or parameters are specified in a different way, the uncertainties may differ.

In some cases the default uncertainties in Annex B of the present document are the same as used for equivalent base station test specifications, which have sometimes been agreed earlier than the UE test specifications.

7 Determination of Test Tolerances

7.1 General

The general principles given in the present document are applied to each test case, according to the applicable uncertainties and requirements to obtain a correct verdict.

The test cases which have been analysed to determine Test Tolerances are included the present document as .zip files. The name of the zip file indicates the test cases covered.

Annex A gives the rationale for their inclusion.

Annex A: Derivation documents

The documents (and spreadsheets where applicable) used to derive the test tolerances for each test case are included in the present document as zip files.

The aim is to provide a reference to completed test cases, so that test tolerances for similar test cases can be derived on a common basis. The information on test case grouping in section 5 can be used to identify similarities.

Annex B: Default uncertainties

This annex contains suggested uncertainties, grouped according to types of test case. The aim is to provide a consistent set of uncertainties across similar test cases to allow efficient implementation.

This Annex is informative only, as the acceptable uncertainties of a test system are defined in Annex F of 36.521-3 [5].

B.0 AWGN and Fading

The following uncertainties and parameters are suggested for E-UTRA AWGN and Fading:

Table B.0-1: Parameters for E-UTRA AWGN and Fading

AWGN Bandwidth	≥ 1.08MHz, 2.7MHz, 4.5MHz, 9MHz, 13.5MHz, 18MHz; N_{RB} x 180kHz according to BW_{Config}
AWGN absolute power uncertainty	Test-specific
AWGN flatness and signal flatness, max deviation for any Resource Block, relative to average over BW_{Config}	±2 dB
AWGN peak to average ratio	≥10 dB @0.001%
Signal-to noise ratio uncertainty	Test-specific
Fading profile power uncertainty - For 1 Tx antenna: - For 2 Tx antenna	 ±0.5 dB ±0.7 dB
Fading profile delay uncertainty, relative to frame timing	±5 ns (excludes absolute errors related to baseband timing)

Values are chosen to be the same as the performance tests in section 8 of TS 36.521-1 [4].

B.1 Group A: E-UTRA Intra-frequency mobility

The following uncertainties and parameters are suggested for E-UTRA Intra-frequency mobility tests:

Table B.1-1: Maximum Test System Uncertainty for E-UTRA Intra-frequency mobility

N_{oc} averaged over BW_{Config}	±1.0 dB
$\hat{E}s_1 / N_{oc}$ averaged over BW_{Config}	±0.3 dB
$\hat{E}s_2 / N_{oc}$ averaged over BW_{Config}	±0.3 dB
Note: $\hat{E}s_1 / N_{oc}$ is the ratio of cell 1 signal / AWGN $\hat{E}s_2 / N_{oc}$ is the ratio of cell 2 signal / AWGN For tests that use fading, the fading uncertainties are given in Table B.0.1	

Values are chosen to be the same as equivalent parameters for UTRA in TS 34.121-1 [3].

This choice forms a minimum set, so the superposition principle can be applied.

B.2 Group B: E-UTRA Inter-frequency mobility

The following uncertainties and parameters are suggested for E-UTRA Inter-frequency mobility tests:

Table B.2-1: Maximum Test System Uncertainty for E-UTRA Inter-frequency mobility

N_{oc1} averaged over BW_{Config}	±0.7 dB
$\hat{E}s_1 / N_{oc1}$ averaged over BW_{Config}	±0.3 dB
N_{oc2} averaged over BW_{Config}	±0.7 dB
$\hat{E}s_2 / N_{oc2}$ averaged over BW_{Config}	±0.3 dB
Note: N_{oc1} is the AWGN on cell 1 frequency $\hat{E}s_1 / N_{oc1}$ is the ratio of cell 1 signal / AWGN N_{oc2} is the AWGN on cell 2 frequency $\hat{E}s_2 / N_{oc2}$ is the ratio of cell 2 signal / AWGN For tests that use fading, the fading uncertainties are given in Table B.0.1	

N_{oc} values are chosen to be the same as the smallest existing downlink signal uncertainty in TS 36.521-1 [4].

$\hat{E}s / N_{oc}$ values are chosen to be the same as intra-frequency in B.1.

This choice forms a minimum set, so the superposition principle can be applied.

B.3 Group C: E-UTRA Intra-frequency UE reporting accuracy

The following uncertainties and parameters are suggested for E-UTRA Intra-frequency UE reporting accuracy tests:

Table B.3-1: Maximum Test System Uncertainty for E-UTRA Intra-frequency UE reporting accuracy

N_{oc} averaged over BW_{Config}	±0.7 dB
N_{oc} for PRBs #22-27	±1.0 dB
$\hat{E}s_1 / N_{oc}$, $\hat{E}s_2 / N_{oc}$ averaged over BW_{Config}	±0.3 dB
$\hat{E}s_1 / N_{oc}$, $\hat{E}s_2 / N_{oc}$ for PRBs #22-27	±0.8 dB
Note: $\hat{E}s_1 / N_{oc}$ is the ratio of cell 1 signal / AWGN $\hat{E}s_2 / N_{oc}$ is the ratio of cell 2 signal / AWGN	

In these tests the UE measures the power of Cells over specific Physical Resource Block (PRB) numbers #22 to #27. The generic AWGN parameters values similar to those used in performance tests are therefore unsuitable, because the AWGN flatness specification would allow a large deviation for the power in PRBs #22 to #27.

In addition, these tests have separate constraints on the RSRP or RSRQ reported values (derived from UE measurements over PRBs #22 to #27), and on the overall power Io, specified over BW_{Config}.

Two sets of parameters are therefore given. The set averaged over the configured bandwidth have similar values to those already proposed for other tests. The set averaged over PRBs #22 to #27 have wider values, but constraining the deviation enough not to widen the RSRP or RSRQ reporting range too much.

The N_{oc} value averaged over BW_{Config} is chosen to be the same as the smallest existing downlink signal uncertainty in TS 36.521-1 [4].

The N_{oc} value for PRBs #22-27 is chosen to allow some deviation for these specific PRBs compared to the 'averaged over BW_{Config}' figure, but reasonably small compared to the UE reporting accuracy.

The $\hat{E}s / N_{oc}$ values averaged over BW_{Config} are chosen to be the same as intra-frequency in B.1.

The $\hat{E}s / N_{oc}$ values for PRBs #22-27 are chosen to allow some deviation for these specific PRBs compared to the 'averaged over BW_{Config}' figure, but reasonably small compared to the UE reporting accuracy.

This choice forms a minimum set (separately for PRBs #22-27, and for 'averaged over BW_{Config}'), so the superposition principle can be applied.

B.4 Group D: E-UTRA Inter-frequency UE reporting accuracy

The following uncertainties and parameters are suggested for E-UTRA Inter-frequency UE reporting accuracy tests:

Table B.4-1: Maximum Test System Uncertainty for E-UTRA Inter-frequency UE reporting accuracy

N_{oc1}, N_{oc2} averaged over BW_{Config}	±0.7 dB
N_{oc1}, N_{oc2} for PRBs #22-27	±1.0 dB
$\hat{E}s_1$ / N_{oc1}, $\hat{E}s_2$ / N_{oc2} averaged over BW_{Config}	±0.3 dB
$\hat{E}s_1$ / N_{oc1}, $\hat{E}s_2$ / N_{oc2} for PRBs #22-27	±0.8 dB
Note: N_{oc1} is the AWGN on cell 1 frequency $\hat{E}s_1$ / N_{oc1} is the ratio of cell 1 signal / AWGN N_{oc2} is the AWGN on cell 2 frequency $\hat{E}s_2$ / N_{oc2} is the ratio of cell 2 signal / AWGN	

In these tests the UE measures the power of Cells over specific Physical Resource Block (PRB) numbers #22 to #27. The generic AWGN parameters values similar to those used in performance tests are therefore unsuitable, because the AWGN flatness specification would allow a large deviation for the power in PRBs #22 to #27.

In addition, these tests have separate constraints on the RSRP or RSRQ reported values (derived from UE measurements over PRBs #22 to #27), and on the overall power Io, specified over BW_{Config}.

Two sets of parameters are therefore given. The set averaged over the configured bandwidth have similar values to those already proposed for other tests. The set averaged over PRBs #22 to #27 have wider values, but constraining the deviation enough not to widen the RSRP or RSRQ reporting range too much.

The N_{oc} value averaged over BW_{Config} is chosen to be the same as the smallest existing downlink signal uncertainty in TS 36.521-1 [4].

The N_{oc} value for PRBs #22-27 is chosen to allow some deviation for these specific PRBs compared to the 'averaged over BW_{Config}' figure, but reasonably small compared to the UE reporting accuracy.

The $\hat{E}s$ / N_{oc} values averaged over BW_{Config} are chosen to be the same as inter-frequency in B.2.

The $\hat{E}s$ / N_{oc} values for PRBs #22-27 are chosen to allow some deviation for these specific PRBs compared to the 'averaged over BW_{Config}' figure, but reasonably small compared to the UE reporting accuracy.

This choice forms a minimum set (separately for PRBs #22-27, and for 'averaged over BW_{Config}'), so the superposition principle can be applied.

B.5 Group E: E-UTRA Random Access

The following uncertainties and parameters are suggested for E-UTRA Random Access tests:

Table B.5-1: Maximum Test System Uncertainty for E-UTRA Random Access

Downlink signal:	
N_{oc} averaged over BW_{Config}	±0.7 dB
$\hat{E}s$ / N_{oc} averaged over BW_{Config}	±0.3 dB
Uplink signal:	
Absolute power measurement	±0.7 dB
Power step relative measurement	±0.7 dB
Uplink signal transmit timing relative to downlink	±3Ts T_S = 1/(15000 x 2048) seconds, the basic timing unit defined in TS 36.211

The downlink N_{oc} and Ês / N_{oc} values are chosen to be the same as intra-frequency in B.3. The downlink signal uncertainties are critical for random access tests because the UE uses RSRP to calculate path loss, and hence to set the uplink power to the desired value.

The uplink power absolute signal measurement uncertainty value is chosen to be the same as the Maximum Output Power test 6.2.2 in Annex F of TS 36.521-1 [4]. The uplink power relative signal measurement uncertainty value is chosen to be the same as the Relative Power control test 6.3.5.2 in Annex F of TS 36.521-1 [4].

The uncertainty for uplink signal transmit timing relative to downlink measurement was derived by taking 25% of the tightest UE core requirement, which is 12 * T_s for ≥3 MHz Channel bandwidth, giving a ±3*Ts uncertainty.

The timing uncertainty is expressed in units of T_S = 1/(15000 x 2048) seconds, the basic timing unit defined in TS 36.211 [7].

These choices form a minimum set, so the superposition principle can be applied.

B.6 Group F: E-UTRA Transmit timing and Timing advance

The following uncertainties and parameters are suggested for E-UTRA Transmit timing and Timing advance tests:

Table B.6-1: Maximum Test System Uncertainty for E-UTRA Transmit timing and Timing advance

Downlink signal:	
N_{oc} averaged over BW_{Config}	±3.0 dB
Ês / N_{oc} averaged over BW_{Config}	±0.3 dB
Uplink signal:	
Uplink signal transmit timing relative to downlink	±3Ts T_S = 1/(15000 x 2048) seconds, the basic timing unit defined in TS 36.211
Relative UE timing adjustment	±0.5Ts T_S = 1/(15000 x 2048) seconds, the basic timing unit defined in TS 36.211

The downlink uncertainty values are chosen to be the same as the performance tests in section 8 of TS 36.521-1 [4]. For Transmit timing and Timing advance tests, neither the absolute level of Noc nor the signal to noise ratio is critical.

The uncertainty for uplink signal transmit timing relative to downlink measurement was derived by taking 25% of the tightest UE core requirement, which is 12 * T_s for ≥3 MHz Channel bandwidth, giving a ±3*Ts uncertainty.

The uncertainty for relative UE timing adjustment was derived by taking 25% of the tightest UE core requirement, which is 2 * T_s for ≥10 MHz Channel bandwidth, giving a ±0.5 * T_s uncertainty.

Both timing uncertainties are expressed in units of T_S = 1/(15000 x 2048) seconds, the basic timing unit defined in TS 36.211 [7].

These choices form a minimum set, so the superposition principle can be applied.

B.7 Group G: E-UTRA In-sync and Out-of-sync

The following uncertainties and parameters are suggested for E-UTRA In-sync and Out-of-sync tests:

Table B.7-1: Maximum Test System Uncertainty for E-UTRA In-sync and Out-of-sync

Downlink signal:	
N_{oc} averaged over BW_{Config}	±3.0 dB
Ês / N_{oc} averaged over BW_{Config}	±0.3 dB
Note: For tests that use fading, the fading uncertainties are given in Table B.0.1	

Values are chosen to be the same as the performance tests in section 8 of TS 36.521-1 [4]. For In-sync and Out-of-sync tests, as with performance tests, the absolute level of Noc is not critical, but the signal to noise ratio is critical.

This choice forms a minimum set, so the superposition principle can be applied.

Annex C:
Change History

Change history							
Date	**TSG #**	**TSG Doc.**	**CR**	**Rev**	**Subject/Comment**	**Old**	**New**
2010-02	RAN5#46	R5-072185	-	-	TR 36.903 Skeleton proposed for RAN5#46	-	0.0.1
2010-06	-	-	-	-	TR 36.903 update proposed	0.0.1	0.0.x
2010-08	RAN5#48	-	-	-	TR 36.903 update proposed	0.0.x	0.0.2
2010-08	RAN5#48	R5-104409	-	-	TR 36.903 update proposed including all docs agreed on RAN5#48	0.0.2	0.1.0
2010-09	-	-	-	-	Small editorial corrections	0.1.0	0.1.1
2010-09	RAN5#49	R5-106802	-	-	TR 36.903 update proposed including all docs agreed on RAN5#49	0.1.1	1.0.0
2010-12	RAN5#50	R5-101182	-	-	TR 36.903 v1.0.0 on Derivation of test tolerances for multi-cell RRM conformance tests (Approval)	1.0.0	8.0.0

History

Document history		
V8.0.0	January 2011	Publication