



**LTE;
Evolved Universal Terrestrial Radio Access (E-UTRA)
and Evolved Universal Terrestrial
Radio Access Network (E-UTRAN);
Derivation of test points for radio transmission and reception
conformance test cases
(3GPP TR 36.905 version 13.0.0 Release 13)**



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Foreword

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

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1 Scope

The present document specifies and contains the derivation of Test Points for RF test cases, thereby 3GPP TSG RAN WG5 will have a way of storing the input contributions provided. The test cases are described in TS36.521-1[2].

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

The present document is applicable from Release 10 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.
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- [1] 3GPP TR 21.905: "Vocabulary for 3GPP Specifications".
 - [2] 3GPP TS 36.521-1: "User Equipment (UE) conformance specification, Radio transmission and reception Part 1: conformance testing".
 - [3] 3GPP TS 36.101: "E-UTRA UE radio transmission and reception".
 - [4] 3GPP TS 36.521-2: "Evolved Universal Terrestrial Radio Access (E-UTRA); User Equipment (UE) conformance specification; Radio transmission and reception; Part 2: Implementation Conformance Statement (ICS)".
-

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 36.521-1 [2] or 3GPP TS 36.101 [3].

3.2 Symbols

Symbols used in the present document are listed in 3GPP TR 21.905 [1], 3GPP TS 36.521-1 [2] or 3GPP TS 36.101 [3].

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 36.521-1 [2] or 3GPP TS 36.101 [3].

4 Test coverage analysis

4.1 Test point selection in Additional Maximum Power Reduction (A-MPR) test cases

When deriving test points for these test cases the calculation of maximum output power backoff and determination of possible worst cases for out-of-band emissions are non-trivial and therefore require an analysis which is documented here.

4.1.1 A-MPR test case for single carrier

This section contains information on test point selection for test case 6.2.4 in [2], Additional Maximum Power Reduction (A-MPR).

Test points in this test were added in the past, and no selection information is therefore available.

4.1.2 A-MPR test case for intra-band contiguous UL CA

This section contains information on test point selection for test case 6.2.4A.1 in [2], Additional Maximum Power Reduction (A-MPR) for CA (intra-band contiguous DL CA and UL CA).

The analyses are performed per NS-value and are stored as zip-files as defined in annex A.

4.1.3 A-MPR test case for inter-band UL CA

This section contains information on test point selection for test case 6.2.4A.2 in [2], Additional Maximum Power Reduction (A-MPR) for CA (inter-band DL CA and UL CA).

TS 36.101 [3] specifies band dependent NS-values, which in the inter-band UL CA test cases become a combination of two NS-values. Testing all possible combinations would lead to too excessive testing and the combinations that are realistic should therefore be prioritized. This selection is documented in table 4.1.3-1.

Table 4.1.3-1: A-MPR test coverage per CA configuration for inter-band CA with 2 CC

CA config with UL CA support (Note 1)	NS values in same order as Uplink CA Configuration column		Applicable test case	Comment/Justification
CA_1A-3A	NS_05	NS_01	6.6.3.3A.2	Note 3
CA_1A-5A	NS_05	NS_01	6.6.3.3A.2	
CA_1A-7A	NS_05	NS_01	6.6.3.3A.2	
CA_1A-8A	NS_05	NS_01	6.6.3.3A.2	
CA_1A-19A	NS_05	NS_08	6.6.3.3A.2	Note 3
CA_1A-21A	NS_05	NS_09	6.6.3.3A.2	Note 3
CA_2A-4A	NS_03	NS_03	6.6.2.2A.2	
CA_2A-13A	NS_03	NS_06	6.6.2.2A.2	
CA_2A-13A	NS_03	NS_07	6.6.2.2A.2, 6.6.3.3A.2	
CA_3A-5A			N/A	Note 2
CA_3A-7A			N/A	Note 2
CA_3A-8A			N/A	Note 2
CA_3A-19A	NS_01	NS_08	6.6.3.3A.2	Note 3
CA_3A-20A			N/A	Note 2
CA_3A-26A	NS_01	NS_12, NS_15	6.6.3.3A.2	
CA_4A-5A	NS_03	NS_01	6.6.2.2A.2	
CA_4A-7A	NS_03	NS_01	6.6.2.2A.2	
CA_4A-12A	NS_03	NS_06	6.6.2.2A.2	
CA_4A-13A	NS_03	NS_06	6.6.2.2A.2	
CA_4A-13A	NS_03	NS_07	6.6.2.2A.2, 6.6.3.3A.2	
CA_4A-17A	NS_03	NS_06	6.6.2.2A.2	
CA_5A-7A			N/A	Note 2
CA_5A-12A	NS_01	NS_06	6.6.2.2A.2	
CA_19A-21A	NS_08	NS_09	6.6.3.3A.2	
Note 1: As per TS 36.101 V12.10.1				
Note 2: No test required since band combinations where only NS_01 is possible have no additional requirements, covered by section 6.2.3 test cases in TS 36.521-1 [2]				
Note 3: No test required since only A-Spur requirements apply, and the frequency range to test is unaffected by intermodulation products as described in section 4.3.				

The analyses are performed per NS-value and are stored as zip-files as defined in annex A. The general principle for selection of test points is:

- Test the minimum MPR + A-MPR value
- Test the maximum MPR + A-MPR value
- Test the maximum unbalanced total power backoff among CCs (max $P_{\text{cm}axc}$ difference).

The analyses are done for QPSK/16QAM test cases. For 64QAM test cases no analysis is made due to that it follows the same selection principle.

4.2 Test frequency and bandwidth selection in Reference sensitivity test cases

The determination of test frequency and channel bandwidths are made considering test time, possible worst cases and operator deployments. This is non-trivial and requires an analysis which is documented here.

4.2.1 Reference sensitivity level for single carrier

This section contains information on test point selection for test case 7.3 in [2], Reference sensitivity level

Test points in this test were added in the past, and no selection information is therefore available.

4.2.2 Reference sensitivity level for intra-band contiguous CA

This section contains information on test point selection for test cases 7.3A.1 - Reference sensitivity level for CA (intra-band contiguous DL CA and UL CA) and 7.3A.2 - Reference sensitivity level for CA (intra-band contiguous DL CA without UL CA).

In this test case, there are no CA configuration specific test points. The general rule of Low, High test frequency and Lowest N_{RB_agg} , Highest N_{RB_agg} is chosen for any CA configuration.

4.2.3 Reference sensitivity level for inter-band CA

This section contains information on test point selection for test case 7.3A.3 - Reference sensitivity level for CA (inter-band DL CA without UL CA)

In this test case, there are default test points to be used unless CA configuration specific test points are over-ruling in table 4.2.3-1. The default rule of Mid test frequency and Highest N_{RB_agg} is chosen for any CA configuration.

Table 4.2.3-1: CA configuration specific test points for inter-band CA with 2 CC

CA config	Justification	Comments
CA_1A-3A	-	
CA_1A-11A	-	
CA_1A-18A	-	
CA_1A-19A	-	
CA_1A-21A	-	
CA_1A-26A	-	
CA_1A-28A	-	
CA_1A-41A	-	
CA_2A-13A	-	
CA_3A-8A	-	
CA_3A-19A	-	
CA_3A-26A	-	
CA_3A-27A	-	
CA_3A-28A	-	
CA_3A-42A	Test points are selected based on RAN4 defined exceptions	
CA_4A-5A	-	
CA_4A-13A	-	
CA_4A-17A	-	
CA_8A-11A	-	
CA_11A-18A	-	
CA_18A-28A	-	
CA_19A-21A	-	
CA_26A-41A	-	
CA_28A-41A	Test points are selected based on the industrial reason	
CA_28A-42A	Test points are selected based on RAN4 defined exceptions	
CA_39A-41A	-	
CA_7A-28A	-	

4.2.4 Reference sensitivity level for intra-band non-contiguous CA

This section contains information on test point selection for test case 7.3A.4 Reference sensitivity level for CA (intra-band non-contiguous DL CA without UL CA).

Testpoint choice is based on the Table 7.3A.0-3. Only largest PCC BW + largest SCC BW and largest PCC BW + smallest SCC BW are tested. All corner cases VS W_{gap} specified for those 2 BW combinations in the Table 7.3A.0-3 are tested, larger W_{gap} being considered worse. PCC is allocated to the upper carrier, unless DL Band is below UL Band. Most testpoint IDs for FDD bands have to be tested twice, once with RB allocation applicable to PCC REFSENS test, which is the standard single carrier RB allocation, and once with RB Allocation applicable to SCC REFSENS test, as per Table 7.3A.0-3.

4.2.5 Reference sensitivity level for 3DL CA

This section contains information on test point selection for test case 7.3A.5 Reference sensitivity level for CA (3DL CA without UL CA)

In the applicability conditions in TS 36.521-2 [4] it is defined that if the 3DL test is performed, testing of any 2DL fallbacks can be skipped.

4.2.5.1 Intra-band

In this case, there are default test points to be used unless CA configuration specific test points are over-ruling. The default rule of Low and High test frequency, Lowest and Highest N_{RB_agg} is chosen for any CA configuration.

Editor's note: The specific test points for reference sensitivity level and 3DL CA Intra-band are under investigation.

4.2.5.2 Inter-band

In this case, there are default test points to be used unless CA configuration specific test points are over-ruling in table 4.2.5.2-1. The default rule of Mid test frequency and Highest N_{RB_agg} is chosen for any CA configuration.

Selection of test points should include some possible worst combinations and these can be based on operator preference in case of the CA configuration is operator specific. The number of test points should not exceed the total number of the maximum number of the test points to cover fallback of 2DL CA case.

Table 4.2.5.2-1: CA configuration specific test points for 3DL CA (Inter-band)

CA config	Justification	Comments
CA_1A-3A-5A	See attachment 'TpAnalysis3DLRefSens_7.3A.5(1A-3A-5A).zip'	
CA_1A-3A-7A	See attachment 'TpAnalysis3DLRefSens_7.3A.5(1A-3A-7A).zip'	Added at RAN5#70
CA_1A-3A-8A	See attachment 'TpAnalysis3DLRefSens_7.3A.5(1A-3A-8A).xls'	Added at RAN5#69
CA_1A-3A-19A	-	
CA_1A-3A-20A	See attachment 'TpAnalysis3DLRefSens_7.3A.5(1A-3A-20A).zip'	Added at RAN5#70
CA_1A-3A-42A	See attachment 'TpAnalysis3DLRefSens_7.3A.5(1A-3A-42A).zip'	Added RAN5#70
CA_1A-8A-11A	See attachment 'TpAnalysis3DLRefSens_7.3A.5(1A-8A-11A).zip'	Added at RAN5#71
CA_1A-18A-28A	-	
CA_1A-19A-21A	-	
CA_1A-19A-28A	See attachment 'TpAnalysis3DLRefSens_7.3A.5(1A-19A-28A).zip'	Added RAN5#70
CA_2A-4A-5A	See attachment 'TpAnalysis3DLRefSens_7.3A.5.zip'	Added at RAN5#69
CA_2A-4A-12A	See attachment 'TpAnalysis3DLRefSens_7.3A.5(2A-4A-12A).zip'	
CA_2A-4A-13A	See attachment 'TpAnalysis3DLRefSens_7.3A.5(2A-4A-13A).zip'	
CA_2A-5A-13A	See attachment 'TpAnalysis3DLRefSens_7.3A.5(2A-5A-13A).zip'	Added at RAN5#68
CA_4A-5A-13A	See attachment 'TpAnalysis3DLRefSens_7.3A.5(4A-5A-13A).zip'	Added at RAN5#68
CA_3A-7A-8A	See attachment 'TpAnalysis3DLRefSens_7.3A.5(3A-7A-8A).zip'	Added at RAN5#71
CA_3A-19A-42A	See attachment 'TpAnalysis3DLRefSens_7.3A.5(3A-19A-42A).zip'	Added RAN5#70

4.2.5.3 Intra-band contiguous + Inter-band

In this test case, there are default test points to be used unless CA configuration specific test points are over-ruling in table 4.2.5.3-1. The default rule of Low and High test frequency for the band with 2 CC and Mid test frequency for the band with 1CC, Lowest and Highest N_{RB_agg} for the band with 2 CC and Highest N_{RB_agg} for the band with 1 CC is chosen for any CA configuration.

Table 4.2.5.3-1: CA configuration specific test points for 3DL CA (Intra-band contiguous + Inter-band)

CA config	Justification	Comments
CA_3A-42C	Exception of Test configuration for CA_3A-42C is needed and test points are selected based on RAN4 defined exception points	Added at RAN5#68
CA_28A-41C	See attachment 'TpAnalysis3DLRefSens_7.3A.5(28A-41C).zip'	Added at RAN5#71
CA_28A-42C	See attachment 'TpAnalysis3DLRefSens_7.3A.5(28A-42C).zip'	Added at RAN5#71
CA_39A-41C, CA_39C-41A	Choose Mid range for B41, choose Low, mid, high range for B39 according to the real deploy condition	Added at RAN5#68

4.2.5.4 Intra-band non-contiguous + Inter-band

In this test case, there are default test points for each intra-band non-contiguous band to be used unless CA configuration specific test points are over-ruling in table 4.2.5.4-1. The default test points are based on fallback non-contiguous CA test points, with the inter-band CC using Max N_{RB} and Mid test frequency, as per default Inter-Band test points.

Table 4.2.5.4-1: CA configuration specific test points for 3DL CA (Intra-band non-contiguous + Inter-band)

CA config	Justification	Comments
CA_2A-2A-5A	See attachment 'TpAnalysis3DLRefSens_7.3A.5(2A-2A-XA).zip'	Added at RAN5#68 Modified at RAN5#69
CA_2A-2A-13A	See attachment 'TpAnalysis3DLRefSens_7.3A.5(2A-2A-XA).zip'	
CA_3A-3A-XA	Test point choice based on fallback CA_3A-3A test points,	Added at RAN5#69
CA_4A-4A-5A	See attachment 'TpAnalysis3DLRefSens_7.3A.5(4A-4A-XA).zip'	Added at RAN5#68 Modified at RAN5#69
CA_4A-4A-7A	See attachment 'TpAnalysis3DLRefSens_7.3A.5(4A-4A-XA).zip'	
CA_XA-42A-42A	Test point choice based on fallback CA_42A-42A test points,	Added at RAN5#69
CA_4A-4A-12A	Exception of Test configuration for CA_4A-4A-12A is needed due to H3 of B12 TX falling into B4 RX if B12 is PCC. Test points are selected based on RAN4 defined exception points.	Added at RAN5#69

4.2.5.5 Intra-band non-contiguous + Intra-band contiguous

Testpoint choice is based on the Table 7.3A.0-3. Only largest PCC sub-block BW / N_{RB_agg} + largest SCC-only sub-block BW / N_{RB_agg} and largest PCC sub-block BW / N_{RB_agg} + smallest SCC-only sub-block BW / N_{RB_agg} are tested. All corner cases VS W_{gap} specified for those 2 BW combinations in the Table 7.3A.0-3 are tested, larger W_{gap} being considered worse. PCC is allocated to the highest carrier, unless DL Band is below UL Band. Most testpoint IDs for FDD bands have to be tested twice, once with RB allocation applicable to PCC REFSENS test, which is the standard single carrier RB allocation, and once with RB Allocation applicable to SCC REFSENS test, as per Table 7.3A.0-3.

4.3 Test points selection and Frequency ranges to cover in Tx spurious emissions test cases for UL CA

In this case, it is sufficient to verify the minimum requirements in frequency ranges affected by 2nd and 3rd order intermodulation products. The frequency ranges used in the test is calculated here.

The analyses are performed per CA configuration and are stored as zip-files as defined in annex A.

Table 4.3-1: Frequency range analysis availability per CA configuration

CA config	File name	Comments
CA_1A-3A	TpAnalysisSpur(1A-3A).zip	Added at RAN5#68
CA_1A-19A	TpAnalysisSpur(1A-19A).zip	Added at RAN5#70
CA_1A-21A	TpAnalysisSpur(1A-21A).zip	Added at RAN5#70
CA_3A-19A	TpAnalysisSpur(3A-19A).zip	Added at RAN5#70
CA_4A-5A	TpAnalysisSpur(4A-5A).zip	Added at RAN5#71
CA_4A-7A	TpAnalysisSpur(4A-7A).zip	Added at RAN5#71
CA_5A-12A	TpAnalysisSpur(5A-12A).zip	Added at RAN5#71
CA_19A-21A	TpAnalysisSpur(19A-21A).zip	Added at RAN5#70

4.4 Test points selection in 3DL Receiver test cases to align with 2DL test cases and skipping of 2DL fallback

This section contains information, per test case, for 2DL and 3DL CA Receiver test cases about alignment of test parameters between 2DL and 3DL variant of the same test, and recommendation on possible skipping of 2DL test if 3DL test is performed.

Editor's note: Information about alignment of test parameters between 2DL and 3DL variant of the same test will be added in this section for relevant test cases.

Annex A: Derivation documents

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

The name of the zip shall:

- Include a prefix allowing easier grouping of files in the same area, e.g. 'TestReqTxSpur2UL'.
- Include Test Case Number(s), e.g. '6.6.3.1A.2+6.6.3.2A.2'.
- In cases where multiple analysis is needed per test cases, e.g. for different CA configurations, include the CA band combination applicable in the parentheses, e.g. add '(1A-3A)' for CA_1A-3A.

Concatenated example file name: 'TestReqTxSpur2UL_6.6.3.1A.2+6.6.3.2A.2(1A-3A).zip'.

If there is an update of test points for a test case the old corresponding zip file shall be replaced with a new zip file with a version stepping in the file name. e.g. 'TestReqTxSpur2UL_6.6.3.1A.2+6.6.3.2A.2(1A-3A)_V2.zip'. The aim is to provide a reference to completed test cases, so that test points for similar test cases can be selected on a common basis.

Annex B:

Change history

Change history							
Date	TSG #	TSG Doc.	CR	Rev	Subject/Comment	Old	New
2015-04	RAN5#67	R5-152110	-	-	TR 36.905 Skeleton proposed for RAN5#67	-	0.0.1
2015-09	RAN5#68	R5-154027	-	-	Text proposal to TR 36.905 v0.0.1	0.0.1	0.0.2
2015-11	RAN5#69	R5-155414	-	-	Text proposal to TR 36.905 v0.0.1 (Justification of Reference sensitivity level for CA_3A-42A)	0.0.2	2.0.0
2015-11	RAN5#69	R5-155669	-	-	Text proposal to TR 36.905 v0.0.2 - Test point selection for CA_2A-4A-5A in Reference sensitivity test case 7.3A.5	0.0.2	2.0.0
2015-11	RAN5#69	R5-155854	-	-	Addition of Test Points for CA_1A-3A-8A to TR 36.905 v0.0.2	0.0.2	2.0.0
2015-11	RAN5#69	R5-155858	-	-	Add test point's analysis for 7.3A.5 Reference sensitivity level for CA(Intra-band non-contiguous + Inter-band)	0.0.2	2.0.0
2015-12	RAN#70	-	-	-	brought under change control by MCC	2.0.0	12.0.0
2016-03	RAN#71	R5-160830	0008	1	Add Test point analysis for Reference sensitivity test case 7.3A.5 for CA_4A-4A-13A	12.0.0	12.1.0
2016-03	RAN#71	R5-160832	0003	1	Addition of test point derivation explanation for 3DL CA REFSENS testcases, Intel combinations	12.0.0	12.1.0
2016-03	RAN#71	R5-160842	0006	1	Test coverage analysis for Inter-band CA A-MPR test case	12.0.0	12.1.0
2016-03	RAN#71	R5-160843	0007	1	Add Test point analysis for A-MPR test case 6.2.4A.2	12.0.0	12.1.0
2016-03	RAN#71	R5-160844	0001	1	Addition of test points selection for 2UL inter-band CA spurious test cases	12.0.0	12.1.0
2016-03	RAN#71	R5-161011	0005	1	36.905 Addition of Test Points for CA_1A-3A-7A	12.0.0	12.1.0
2016-03	RAN#71	R5-161013	0004	1	36.905 Addition of Test Points for CA_1A-3A-20A	12.0.0	12.1.0
2016-03	RAN#71	R5-161060	0002	1	Addition of test points analysis for CA_1A-3A-42A, CA_1A-19A-28A and CA_3A-19A-42A	12.0.0	12.1.0
2016-06	RAN#72	R5-162871	0015	1	Addition of test points selection for 2UL inter-band CA spurious test cases	12.1.0	12.2.0
2016-06	RAN#72	R5-162998	0013	1	A-MPR band coverage for inter-band UL CA	12.1.0	12.2.0
2016-06	RAN#72	R5-162999	0014	1	Test point analysis for A-MPR test case 6.2.4A.2	12.1.0	12.2.0
2016-06	RAN#72	R5-162360	0010	-	Test point and test requirements analysis for CA_4A-5A spurious test cases	12.2.0	13.0.0
2016-06	RAN#72	R5-162845	0011	1	36.905 Addition of Test Points for CA_3A-7A-8A	12.2.0	13.0.0
2016-06	RAN#72	R5-162988	0012	1	New CA band combinations CA_28A-41A, CA_28A-41C, CA_28A-42A and CA_28A-42C - Updates of test points analysis	12.2.0	13.0.0
2016-06	RAN#72	R5-163020	0016	-	Addition of test points analysis for CA_1A-8A-11A	12.2.0	13.0.0

History

Document history		
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