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TECHNICAL REPORT

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Derivation of test points for radio transmission and reception User Equipment (UE) conformance test cases (3GPP TR 38.905 version 19.3.0 Release 19)

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Contents

Foreword

This Technical Specification 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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1 Scope

The present document specifies and contains the derivation of Test Points for NR RF test cases, thereby 3GPP TSG RAN WG5 will have a way of storing the input contributions provided. The test cases are described in TS38.521-1[2], TS38.521-2[3] and TS38.521-3[4],

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

The present document is applicable from Release 15 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*.

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

[2] 3GPP TS 38.521-1: "NR; UE conformance specification; Radio transmission and reception; Part 1: NR range 1".

[3] 3GPP TS 38.521-2: "NR; UE conformance specification; Radio transmission and reception; Part 2: NR range 2".

[4] 3GPP TS 38.521-3: "NR; UE conformance specification; Radio transmission and reception; Part 3: NR interworking between NR range1 + NR range2 and between NR and LTE".

[5] 3GPP TS 38.101-1: “NR; User Equipment (UE) radio transmission and reception; Part 1: Range 1 Standalone”.

[6] 3GPP TS 38.101-2: “NR; User Equipment (UE) radio transmission and reception; Part 2: Range 2 Standalone”.

[7] 3GPP TS 38.101-3: “NR; User Equipment (UE) radio transmission and reception; Part 3: Range 1 and Range 2 Interworking operation with other radios”.

[8] 3GPP TS 36.101: Evolved Universal Terrestrial Radio Access (E-UTRA); User Equipment (UE) radio transmission and reception”.

[9] R5-206841: “Discussion on test points in Receiver test cases for EN-DC configurations with exception requirements”.

[10] 3GPP TS 38.521-5: “NR; UE conformance specification; Radio transmission and reception; Part 5: Satellite access Radio Frequency (RF) and performance requirements”.

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].

Other definitions used in the present document are listed in 3GPP TS 38.521-1 [2], 3GPP TS 38.521-2 [3] or 3GPP TS 38.521-3 [4].

Editor's note: intended to capture definitions

3.2 Symbols

Symbols used in the present document are listed in 3GPP TR 21.905 [1], 3GPP TS 38.521-1 [2], 3GPP TS 38.521-2 [3] or 3GPP TS 38.521-3 [4].

Editor's note: intended to capture definitions

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 38.521-1 [2], or 3GPP, 3GPP TS 38.521-1 [2], 3GPP TS 38.521-2 [3] or 3GPP TS 38.521-3 [4].

A-SE	Additional spurious emissions
A-SEM	Spectrum Emission Mask

4 Test coverage analysis

This clause contains information on test point analysis and test point selection for RX and TX test configuration tables in [2], [3] and [4]. The test point analysis should include selection of:

- Test environment
- Test frequencies
- Test channel bandwidth
- Test Subcarrier Spacing (SCS)
- Downlink configuration including modulation and RB allocation
- Uplink configuration including modulation and RB allocation
- Number of test points

4.1 Test point analysis for FR1 test cases in TS 38.521-1

4.1.1 Test point analysis per test case

4.1.1.1 FR1 single carrier, NR CA and UL MIMO test cases

This clause contains information on test point analysis and test point selection for single carrier, NR CA and UL MIMO test cases in [2] clause 6 and 7 with information about transmitting test point selection for FR1 listed in table 4.1.1.1-1 and receiver test point selection in table 4.1.1.1-2.

For 2Tx UL-MIMO, the TP analysis is provided for each test case and included in the zip files as per Table 4.1.1.1-1. For 4Tx UL-MIMO, the TP analysis of 2Tx UL-MIMO could be reused if the minimum requirements are the same. A separate TP analysis will be provided if the minimum requirements of 4Tx UL-MIMO are different with 2Tx UL-MIMO.

Table 4.1.1.1-1: NR UE transmitter test point selection for FR1

Subclause	Number of test points	Justification in attachment	Comments
6.2.1 UE maximum output power	540	“38.521-1_TPanalysis_6.2.1_MaxOP_v3.zip”	RAN5#89-e
6.2.2 Maximum Output Power Reduction (MPR)	contiguous allocation: 920 (1040[1],1000[2,3]) almost contiguous allocation: 120	”38.521-1_TPanalysis_6.2.2_MPR_6.5.2.2_SEM_6.5.2.4.1_NR_ACLR_v5.zip”	RAN5#99
6.2.3 UE A-MPR	See clause 4.1.2.1	See clause 4.1.2.1	See clause 4.1.2.1
6.2.4 Configured Transmitted Power	30	“38.521-1_TPanalysis_6.2.4_ConfigTP_v1.zip”	RAN5#91-e
6.2A.1.1 UE maximum output power for CA (2UL CA)	240	“38.521-1_TPanalysis_6.2A.1_MOP”	RAN5#83
6.2A.2.1 Maximum power reduction (MPR) for CA (2UL CA)	For inter-band CA:1480 For intra-band contiguous CA: 720 (contiguous RB allocation) 1080 (non-contiguous RB allocation) For intra-band non-contiguous CA: 2880	“38.521-1_TPanalysis_6.2A.2_MPR_6.5A.2.4.1_ACLR_6.5A.2.2.1_SEM_v3	RAN5#110
6.2A.1.1G UE maximum output power for CA with TxD (2UL CA)	For intra-band contiguous CA: 720	“38.521-1_TPanalysis_6.2A.2_MPR_6.5A.2.4.1_ACLR_6.5A.2.2.1_SEM_v3”	RAN5#110
6.2A.4 Configured transmitted power for CA	Inter-band CA:20 Intra-band contiguous CA: 20 Intra-band non-contiguous CA:20	“38.521-1_TPanalysis_6.2A.4_ConfigTP_v2.zip”	RAN5#101
6.2C.1 Configured UE transmitted Output Power	270	“38.521-1_TPanalysis_6.2C.1_ConfigOPSUL.zip”	RAN5#80
6.2D.1 UE maximum output power for UL-MIMO	UL MIMO with ULFPTx: 540 UL MIMO with 2-layer: 0	“38.521-1_TPanalysis_6.2.1_MaxOP_v3.zip”	RAN5#89-e
6.2D.2 Maximum Power Reduction (MPR) for UL MIMO	UL MIMO with 2-layer: 400 UL MIMO with ULFPTx: 920	“38.521-1_TPanalysis_6.2.2_MPR_6.5.2.2_SEM_6.5.2.4.1_NR_ACLR_v5.zip	RAN5#99
6.2D.2_2 UE maximum output power reduction for UL MIMO for UE supporting 4Tx	UL MIMO with 4-layer: 340	“38.521-1_TPanalysis_6.2D.2_2_MPR_6.5D.2.2_2_SEM_6.5D.2.4.1_2_ACLR_4TX_MIMO.zip”	RAN5#107
6.2D.3 UE additional maximum output power reduction for UL-MIMO	Table 4.1.2.1-1	Table 4.1.2.1-1	See Table 4.1.2.1-1
6.2D.4 Configured Transmitted Power for UL-MIMO	15	“38.521-1_TPanalysis_6.2.4_ConfigTP_v1.zip”	RAN5#91-e
6.2K.3 Additional maximum output power reduction for Aerial UE	Table 4.1.2.1-1	Table 4.1.2.1-1	See Table 4.1.2.1-1
6.5K.3.3 Additional spurious emissions for Aerial UE	Table 4.1.2.1-1	Table 4.1.2.1-1	See Table 4.1.2.1-1

6.3.1 Minimum output power	45	“38.521-1_TPanalysis_6.3.1_MinOP_v3.zip”	RAN5#5-5G-NR Adhoc
6.3.3.2 General ON/OFF time mask	180	“38.521-1_TPanalysis_6.3.3.2_OnOff_M_v2.zip”	RAN5#5-5G-NR Adhoc
6.3.3.4 PRACH time mask		“38.521-1_TPanalysis_6.3.3.4_PRACH.zip”	RAN5#96-e
6.3.3.6 SRS time mask	30	“38.521-1_TPanalysis_6.3.3.3_SRS.zip”	RAN5#82
6.3.4.2 Absolute power tolerance	6	“38.521-1_TPanalysis_6.3.4.2_AbsPtol_v2.zip”	RAN5#83
6.3.4.3 Relative power tolerance	TBD	“38.521-1_TPanalysis_6.3.4.3_RelPtol_v2.zip”	RAN5#83
6.3.4.4 Aggregate power tolerance	PUCCH: 6 PUSCH: 6	“38.521-1_TPanalysis_6.3.4.4_AggPtol_v2.zip”	RAN5#83
6.3A.1.1 Minimum output power for CA (2UL CA)	20	38.521-1_TPanalysis_6.3A.1.1_MinOP_CA_v1.zip	RAN5#101
6.3A.3.1 Transmit ON/OFF time mask for CA (2UL CA)	40	“38.521-1_TPanalysis_6.3A.3.1_OnOff_M_CA_v1.zip”	RAN5#99
6.3A.3.2 Time mask for switching between two uplink carriers	1	“38.521-1_TPanalysis_6.3C.3.2_SULTxSwitch_M_v2.zip“	RAN5#108
6.3A.3.3 Time mask for switching between two uplink carriers	1	“38.521-1_TPanalysis_6.3C.3.2_SULTxSwitch_M_v2.zip“	RAN5#108
6.3A.3.4 Time mask for switching between one uplink band with one transmit antenna connector and one uplink band with two transmit antenna connectors (3UL CA)	1	“38.521-1_TPanalysis_6.3C.3.2_SULTxSwitch_M_v2.zip“	RAN5#108
6.3A.3.5 Time mask for switching between two uplink bands with two transmit antenna connectors (3UL CA)	1	“38.521-1_TPanalysis_6.3C.3.2_SULTxSwitch_M_v2.zip“	RAN5#108
6.3A.3.6 Time mask for switching across three uplink bands	1	“38.521-1_TPanalysis_6.3A.3.6-6.3A.3.7_TxSwitch_M_3-4Band_v1.zip”	RAN5#110
6.3A.3.6_1 Time mask for switching across three uplink bands (more than 3CC)	1	“38.521-1_TPanalysis_6.3A.3.6-6.3A.3.7_TxSwitch_M_3-4Band_v1.zip”	RAN5#110
6.3A.3.7 Time mask for switching across four uplink bands	1	“38.521-1_TPanalysis_6.3A.3.6-6.3A.3.7_TxSwitch_M_3-4Band_v1.zip”	RAN5#110
6.3A.4.1 Absolute power tolerance for CA (2UL CA)	Intra-band contiguous CA:4 Intra-band non-contiguous CA:2	“38.521-1_TPanalysis_6.3A.4.1_Abs_PTol_CA_v3.zip”	RAN5#95-e
6.3A.4.2 Relative power tolerance for CA (2UL CA)	TBD	“38.521-1_TPanalysis_6.3A.4.2_Rel_PTol_CA_v1.zip”	RAN5#92-e
6.3A.4.3 Aggregate power tolerance for CA (2UL CA)	PUCCH:4 PUSCH:4	“38.521-1_TPanalysis_6.3A.4.3_Agg_PTol_CA_v1.zip”	RAN5#92-e
6.3C.3.2 General transmit ON/OFF time mask for switching between two uplink carriers	1	“38.521-1_TPanalysis_6.3C.3.2_SULTxSwitch_M_v2.zip“	RAN5#108

6.3C.3.3 General transmit ON/OFF time mask for switching between two uplink carriers with two transmit antenna connectors	1	“38.521-1_TPanalysis_6.3C.3.2_SULTxSwitch_M_v2.zip“	RAN5#108
6.3C.3.4 General transmit ON/OFF time mask for switching between one uplink band with one transmit antenna connector and one uplink band with two transmit antenna connectors	1	“38.521-1_TPanalysis_6.3C.3.2_SULTxSwitch_M_v2.zip“	RAN5#108
6.3C.3.5 General transmit ON/OFF time mask for switching between two uplink bands with two transmit antenna connectors	1	“38.521-1_TPanalysis_6.3C.3.2_SULTxSwitch_M_v2.zip“	RAN5#108
6.3C.3.6 Time mask for switching across three uplink bands (3CC)	1	38.521-1_TPanalysis_6.3C.3.6-6.3C.3.6_1_TxSwitch_M_3Band_v1.zip “”	RAN5#104
6.3C.3.6_1 Time mask for switching across three uplink bands (more than 3CC)	1	38.521-1_TPanalysis_6.3C.3.6-6.3C.3.6_1_TxSwitch_M_3Band_v1.zip	RAN5#104
6.3D.1 Minimum output power for UL-MIMO	45	“38.521-1_TPanalysis_6.3.1_MinOP_v3.zip”	RAN5#5-5G-NR Adhoc
6.3D.3 Transmit ON/OFF time mask for UL-MIMO	TBD	“38.521-1_TPanalysis_6.3.3.2_OnOff_M_v2.zip”	RAN5#5-5G-NR Adhoc
6.3D.4.1 Absolute Power tolerance for UL-MIMO	6	“38.521-1_TPanalysis_6.3.4.2_AbsPtol_v2.zip”	RAN5#83
6.3D.4.2 Relative Power Tolerance for UL-MIMO	TBD	“38.521-1_TPanalysis_6.3.4.3_RelPtol_v2.zip”	RAN5#83
6.3D.4.3 Aggregate Power tolerance for UL-MIMO	PUCCH: 6 PUSCH: 6	“38.521-1_TPanalysis_6.3.4.4_AggPtol_v2.zip”	RAN5#83
6.4.1 Frequency error	5	“38.521-1_TPanalysis_6.4.1_FreqErr_v3.zip”	RAN5#84
6.4.2.1 Error Vector Magnitude	PUSCH: 252 PUCCH: 36 PRACH: 36	“38.521-1_TPanalysis_6.4.2.1_EVM_v3.zip”	RAN5#94-e
6.4.2.1a Error Vector Magnitude including symbols with transient period	PUSCH: 36	“38.521-1_TPanalysis_6.4.2.1_EVM_v3.zip”	RAN5#94e
6.4.2.2 Carrier leakage	3	“38.521-1_TPanalysis_6.4.2.2_CarrLeak_v2.zip”	RAN5#84
6.4.2.3 In-band emissions	36	“38.521-1_TPanalysis_6.4.2.3_IE_2.zip”	RAN5#84
6.4.2.4 EVM equalizer spectrum flatness	90	“38.521-1 TPanalysis_6.4.2.4_EVMequalizerSpectrumFlatness_v3.zip”	RAN5#84
6.4.2.5 EVM equalizer spectrum flatness for Pi/2 BPSK	9	“38.521-1 TPanalysis_6.4.2.5_EVMequalizerSpectrumFlatness_BPSK_v2.zip”	RAN5#92-e
6.4.2.6 Phase continuity requirements for DMRS bundling	PUSCH:36 PUCCH:36	38.521-1_TPanalysis_6.4.2.6_Phase_Continuity_v2.zip	RAN5#102

6.4A.1.1 Frequency error for CA (2UL CA)	Inter-band:5 Intra-band contiguous:5 Intra-band non-congituous:5	“38.521-1_TPanalysis on 6.4A.1.1_FreqErr_v1.zip”	RAN5#101
6.4A.2.1.1 Error Vector Magnitude for CA (2UL CA)	inter-band CA:112 Intra-band CA:144	“38.521-1_TPanalysis on 6.4A.2.1.1_EVM_v1.zip”	RAN5#100
6.4A.2.2.1 Carrier leakage for CA (2UL CA)	2	“38.521-1_TPanalysis on 6.4A.2.2.1_CarrLeak_v1.zip”	RAN5#101
6.4A.2.3.1 In-band emissions for CA (2UL CA)	16	“38.521-1_TPanalysis on 6.4A.2.2.1_IBE_v1.zip”	RAN5#101
6.4D.1 Frequency error	5	“38.521-1_TPanalysis_6.4.1_FreqErr_v3.zip”	RAN5#84
6.4D.2.1 Error Vector Magnitude for UL MIMO	PUSCH: 108	“38.521-1_TPanalysis on 6.4.2.1_EVM_v3.zip”	RAN5#94-e
6.4D.2.2 Carrier leakage for UL MIMO	3	“38.521-1_TPanalysis on 6.4.2.2_CarrLeak_v2.zip”	RAN5#84
6.4D.2.3 In-band emissions for UL MIMO	18	“38.521-1_TPanalysis_6.4.2.3_IE_2.zip”	RAN5#84
6.4D.2.4 EVM equalizer spectrum flatness for UL MIMO	45	“38.521-1_TPanalysis_6.4.2.4_EVMequalizerSpectrumFlatness_v3.zip”	RAN5#84
6.4D.3 Time alignment error for UL-MIMO	6	“38.521-1_TP analysis_6.4D.3_6.4H.1.3_TAE_MIMO_v1.zip“	RAN5#102
6.5.1 Occupied bandwidth	10	“38.521-1_TPanalysis_6.5.1_OccBW_v3.zip	RAN5#92-e
6.5.2.2 Spectrum Emission Mask	contiguous allocation: 144 (168[1], 160[2,3]) almost contiguous allocation: 24	“38.521-1_TPanalysis_6.2.2_MPR_6.5.2.2_SEM_6.5.2.4.1_NR_ACLR_v5.zip”	RAN5#99
6.5D.2.3 Additional spectrum emission mask for UL-MIMO	Table 4.1.2.1-1	Table 4.1.2.1-1	See Table 4.1.2.1-1
6.5.2.4.1 NR Adjacent channel leakage ratio	contiguous allocation: 920 (1040[1], 1000[2,3]) almost contiguous allocation: 120	“38.521-1_TPanalysis_6.2.2_MPR_6.5.2.2_SEM_6.5.2.4.1_NR_ACLR_v5.zip”	RAN5#99
6.5.2.4.2 UTRA ACLR	Same as NS_3U, NS_5U ,NS_43U, and NS_100 in Table 4.1.1.1-1	“38.521-1_TPanalysis_6.5.2.4.2_UTRA ACLR_v3.zip”	RAN5#91-e
6.5.3.1 General spurious emissions	27	“38.521-1_TP analysis_6.5.3.1_TX_Spurious_Emission_v1.zip”	RAN5#89-e
6.5.3.2 Spurious emissions for UE co-existence	27	“38.521-1_TP analysis_6.5.3.1_TX_Spurious_Emission_v1.zip”	RAN5#89-e
6.5.3.3 Additional spurious emissions	See Table 4.1.2.1-1	See Table 4.1.2.1-1	See Table 4.1.2.1-1
6.5.4 Transmit intermodulation	8	“38.521-1_TPanalysis_6.5.4_TxIm_v3.zip”	RAN5#100
6.5A.1.1 Occupied bandwidth for CA (2UL CA)	Inter-band: 2 Intra-band contiguous: 1 Intra-band non-contiguous: 1	“38.521-1_TPanalysis_6.5A.1.1_OccBW_v2.zip”	RAN5#92-e

6.5A.2.2.1 Spectrum emission mask for CA (2UL CA)	Inter-band CA:112 Intra-band contiguous CA:72 Intra-band non-contiguous CA:72	"38.521-1_TPanalysis_6.2A.2_MPR_6.5A.2.4.1_ACLR_6.5A.2.2.1_SEM"	RAN5#98
6.5A.2.4.1.1 NR ACLR for CA (2UL CA)	For inter-band CA:1480 For intra-band contiguous CA: 720 (contiguous RB allocation) 1080 (non-contiguous RB allocation) For intra-band non-contiguous CA: 2880	"38.521-1_TPanalysis_6.2A.2_MPR_6.5A.2.4.1_ACLR_6.5A.2.2.1_SEM"	RAN5#98
6.5A.2.4.2.1 UTRA ACLR for CA (2UL CA)	840	"38.521-1_TPanalysis on 6.5A.2.4.2.1 UTRA ACLR.zip"	RAN5#82
6.5A.3.1.1 General spurious emissions for CA (2UL CA)	For inter-band CA: 12 For intra-band contiguous CA: 20 For intra-band non-contiguous CA: 12	"38.521-1_TPanalysis_6.5A.3.1.1_Spurious_v3.zip"	RAN5#101
6.5A.3.2.1 Spurious emissions for UE co-existence for CA (2UL CA)	For inter-band CA See table 4.1.3.2-1 For intra-band contiguous CA: 8 For intra-band non-contiguous CA: 4	"38.521-1_TPanalysis_6.5A.3.2.1_SECoex_v3.zip"	RAN5#100
6.5A.4.1 Transmit intermodulation for CA (2UL CA)	16	"38.521-1_TPanalysis on 6.5A.4.1_TxIM_v1.zip"	RAN5#101
6.5D.1 Occupied bandwidth for UL-MIMO	10	38.521-1_TPanalysis_6.5.1_OBW_v3.zip	RAN5#92-e
6.5D.2.2 Spectrum emission mask for UL MIMO	UL MIMO with 2-layer: 64 UL MIMO with ULFPTx: 144	"38.521-1_TPanalysis_6.2.2_MPR_6.5.2.2_SEM_6.5.2.4.1_NR_ACLR_v5.zip"	RAN5#99
6.5D.2.2_2 Spectrum emission mask for UL MIMO for UE supporting 4Tx	UL MIMO with 4-layer: 56	"38.521-1_TPanalysis_6.2D.2_2_MPR_6.5D.2.2_2_SEM_6.5D.2.4.1_2_ACLR_4TX_MIMO.zip"	RAN5#107
6.5D.2.4.1 NR ACLR for UL-MIMO	UL MIMO with 2-layer: 400 UL MIMO with ULFPTx: 920	"38.521-1_TPanalysis_6.2.2_MPR_6.5.2.2_SEM_6.5.2.4.1_NR_ACLR_v5.zip	RAN5#99
6.5D.2.4.1_2 NR ACLR for UL-MIMO for UE supporting 4Tx	UL MIMO with 4-layer: 340	"38.521-1_TPanalysis_6.2D.2_2_MPR_6.5D.2.2_2_SEM_6.5D.2.4.1_2_ACLR_4TX_MIMO.zip"	RAN5#107
6.5D.2.4.2 UTRA ACLR for UL-MIMO	96 for NS_3U	"38.521-1_TPanalysis_6.5D.2.4.2_UTRA ALCR_NS_3U_v1.zip" "38.521-1_TPanalysis_6.5.2.4.2_UTRA ACLR_v3.zip"	RAN5#5-5G-NR Adhoc
6.5D.2_1.4.2 UTRA ACLR for UL MIMO (Rel-16 onward)	216 for NS_3U	"38.521-1_TPanalysis_6.5D.2.4.2_UTRA ALCR_NS_3U_v1.zip" "38.521-1_TPanalysis_6.5.2.4.2_UTRA ACLR_v3.zip"	RAN5#90-e
6.5D.3.1 General spurious emissions	27	"38.521-1_TP analysis_6.5.3.1_TX_Spurious_Emission_v1.zip"	RAN5#89-e