## 6.5 Output RF spectrum emissions

### 6.5.0 General

Unwanted emissions are divided into "Out-of-band emission" and "Spurious emissions" in 3GPP RF specifications. This notation is in line with ITU-R recommendations such as SM.329-10 and the Radio Regulations ‎[22].

ITU defines:

Out-of-band emission = Emission on a frequency or frequencies immediately outside the necessary bandwidth which results from the modulation process but excluding spurious emissions.

Spurious emission = Emission on a frequency, or frequencies, which are outside the necessary bandwidth and the level of which may be reduced without affecting the corresponding transmission of information. Spurious emissions include harmonic emissions, parasitic emissions, intermodulation products and frequency conversion products but exclude out-of-band emissions.

Unwanted emissions = Consist of spurious emissions and out-of-band emissions.

The UE transmitter spectrum emission consists of the three components: the occupied bandwidth (channel bandwidth), the Out Of Band (OOB) emissions and the far out spurious emission domain.



Figure 6.5.0-1: Transmitter RF spectrum

### 6.5.1 Occupied bandwidth

6.5.1.1 Test purpose

To verify that the UE occupied bandwidth for all transmission bandwidth configurations supported by the UE are less than their specific limits.

6.5.1.2 Test applicability

This test case applies to all types of NR Power Class 1 release 15 and forward.

This test case applies to all types of NR Power Class 2 and Power Class 3 UE release 15 and forward that don’t support Tx diversity.

6.5.1.3 Minimum conformance requirements

Occupied bandwidth is defined as the bandwidth containing 99 % of the total integrated mean power of the transmitted spectrum on the assigned channel. The occupied bandwidth for all transmission bandwidth configurations (Resources Blocks) shall be less than the channel bandwidth specified in Table 6.5.1.3-1.

Table 6.5.1.3-1: Occupied channel bandwidth

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | NR channel bandwidth | | | | | | | | | | | | | | |
|  | 5 MHz | 10 MHz | 15 MHz | 20 MHz | 25 MHz | 30 MHz | 35 MHz | 40 MHz | 45 MHz | 50 MHz | 60 MHz | 70 MHz | 80 MHz | 90 MHz | 100 MHz |
| Occupied channel bandwidth (MHz) | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 | 60 | 70 | 80 | 90 | 100 |

The normative reference for this requirement is TS 38.101-1 [2] clause 6.5.1.

6.5.1.4 Test description

6.5.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, test channel bandwidths and sub-carrier spacing based on NR operating bands specified in table 5.3.5-1. All of these configurations shall be tested with applicable test parameters for each combination of channel bandwidth and sub-carrier spacing, are shown in table 6.5.1.4.1-1. The details of the uplink reference measurement channels (RMCs) are specified in Annexes A.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Table 6.5.1.4.1-1: Test Configuration Table

|  |  |  |  |
| --- | --- | --- | --- |
| Initial Conditions | | | |
| Test Environment as specified in TS 38.508-1 [5] subclause 4.1 | | Normal | |
| Test Frequencies as specified in TS 38.508-1 [5] subclause 4.3.1 | | Mid range by default, exceptions listed in Table 6.5.1.4.1-2 | |
| Test Channel Bandwidths as specified in TS 38.508-1 [5] subclause 4.3.1 | | All | |
| Test SCS as specified in Table 5.3.5-1 | | Lowest | |
| Test Parameters | | | |
| Test ID | Downlink Configuration | Uplink Configuration | |
|  | N/A for occupied bandwidth test case | Modulation | RB allocation (NOTE 1) |
| 1 | CP-OFDM QPSK | Outer\_full |
| NOTE 1: The specific configuration of each RB allocation is defined in Table 6.1-1. | | | |

Table 6.5.1.4.1-2: Test frequency exceptions for Occupied Bandwidth

|  |  |
| --- | --- |
| 5G NR Band | Test Frequency |
| n77 | Low Range, Mid Range, High Range |
| n78 | Low Range, Mid Range, High Range |
| n79 | Low Range, Mid Range, High Range |
| n28 | Low Range for 30MHz channel bandwidth |
| n14 | Low Range for 10MHz channel bandwidth |

1. Connect the SS to the UE antenna connectors as shown in TS 38.508-1 [5] Annex A, Figure A.3.1.1.1 for TE diagram and section A.3.2 for UE diagram.

2. The parameter settings for the cell are set up according to TS 38.508-1 [5] subclause 4.4.3.

3. Downlink signals are initially set up according to Annex C.0, C.1, C.2, and uplink signals according to Annex G.0, G.1, G.2, G.3.0.

4. The UL Reference Measurement channels are set according to Table 6.5.1.4.1-1.

5. Propagation conditions are set according to Annex B.0 -

6. Ensure the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On,* Test Mode *On* and Test Loop Function *On* according to TS 38.508-1 [5] clause 4.5. Message contents are defined in clause 6.5.1.4.3

6.5.1.4.2 Test procedure

1. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0\_1 for C\_RNTI to schedule the UL RMC according to Table 6.5.1.4.1-1. Since the UL has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC.

2. Send continuously power control “up” commands to the UE until the UE transmits at PUMAX level. Allow at least 200ms for the UE to reach PUMAX level.

3. Measure the power spectrum distribution within two times or more range over the requirement for Occupied Bandwidth specification centring on the current carrier frequency. The characteristics of the filter shall be approximately Gaussian (typical spectrum analyser filter). Other methods to measure the power spectrum distribution are allowed. The measuring duration is at least 1ms over consecutive active uplink slots.

4. Calculate the total power within the range of all frequencies measured in step 3 and save this value as “Total power”.

5. Identify the measurement window whose centre is aligned on the centre of the channel for which the sum of the power measured is 99% of the “Total power”.

6. The “Occupied Bandwidth” is the width of the measurement window obtained in step 5.

6.5.1.4.3 Message contents

Message contents are according to TS 38.508-1 [5] subclause 4.6.

6.5.1.5 Test requirement

The measured Occupied Bandwidth shall not exceed values in Table 6.5.1.5-1.

Table 6.5.1.5-1: Occupied channel bandwidth

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | NR channel bandwidth | | | | | | | | | | | | | | |
|  | 5 MHz | 10 MHz | 15 MHz | 20 MHz | 25 MHz | 30 MHz | 35 MHz | 40 MHz | 45 MHz | 50 MHz | 60 MHz | 70 MHz | 80 MHz | 90 MHz | 100 MHz |
| Occupied channel bandwidth (MHz) | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 | 60 | 70 | 80 | 90 | 100 |

### 6.5.2 Out of band emission

#### 6.5.2.1 General

The Out of band emissions are unwanted emissions immediately outside the assigned channel bandwidth resulting from the modulation process and non-linearity in the transmitter but excluding spurious emissions. This out of band emission limit is specified in terms of a spectrum emission mask and an adjacent channel leakage power ratio.

To improve measurement accuracy, sensitivity and efficiency, the resolution bandwidth may be smaller than the measurement bandwidth. When the resolution bandwidth is smaller than the measurement bandwidth, the result should be integrated over the measurement bandwidth in order to obtain the equivalent noise bandwidth of the measurement bandwidth.

#### 6.5.2.2 Spectrum emission mask

6.5.2.2.1 Test purpose

To verify that the power of any UE emission shall not exceed specified level for the specified channel bandwidth.

6.5.2.2.2 Test applicability

This test case applies to all types of NR Power Class 1 release 15 and forward.

This test case applies to all types of NR Power Class 2 and Power Class 3 UE release 15 and forward that don’t support Tx diversity.

6.5.2.2.3 Minimum conformance requirements

The spectrum emission mask of the UE applies to frequencies (ΔfOOB) starting from the ± edge of the assigned NR channel bandwidth. For frequencies offset greater than ΔfOOB, the spurious requirements in subclause 6.5.3 are applicable.

NOTE: For measurement conditions at the edge of each frequency range, the lowest frequency of the measurement position in each frequency range should be set at the lowest boundary of the frequency range plus MBW/2. The highest frequency of the measurement position in each frequency range should be set at the highest boundary of the frequency range minus MBW/2. MBW denotes the measurement bandwidth defined for the protected band.

The power of any UE emission shall not exceed the levels specified in Table 6.5.2.2.3-1 for the specified channel bandwidth.

Table 6.5.2.2.3-1: General NR spectrum emission mask

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| ΔfOOB  (MHz) | Channel bandwidth (MHz) / Spectrum emission limit (dBm) | | | Measurement bandwidth |
| 5 | 10, 15, 20, 25, 30, 35, 40, 45 | 50, 60, 70, 80, 90, 100 |
| ± 0-1 | -13 | -13 |  | 1 % of channel BW |
| ± 0-1 |  |  | -24 | 30 kHz |
| ± 1-5 | -10 | -10 | | 1 MHz |
| ± 5-6 | -13 |  | |
| ± 6-10 | -25 |  | |
| ± 5-BWChannel |  | -13 | |
| ± BWChannel-(BWChannel+5) |  | -25 | |

The normative reference for this requirement is TS 38.101-1 [2] clause 6.5.2.2

6.5.2.2.4 Test description

6.5.2.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, test channel bandwidths and sub-carrier spacing based on NR operating bands specified in table 5.3.5-1. All of these configurations shall be tested with applicable test parameters for each combination of channel bandwidth and sub-carrier spacing, are shown in table 6.5.2.2.4.1-1, 6.5.2.2.4.1-2, 6.5.2.2.4.1-2a and Table 6.5.2.2.4.1-3. The details of the uplink reference measurement channels (RMCs) are specified in Annexes A.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2

Table 6.5.2.2.4.1-1: Test Configuration Table for power class 3 (contiguous allocation)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Default Conditions | | | | | | |
| Test Environment as specified in TS 38.508-1 [5] subclause 4.1 | | | | | Normal | |
| Test Frequencies as specified in TS 38.508-1 [5] subclause 4.3.1 | | | | | Low range, High range | |
| Test Channel Bandwidths as specified in TS 38.508-1 [5] subclause 4.3.1 | | | | | Lowest, Highest | |
| Test SCS as specified in Table 5.3.5-1 | | | | | Lowest, Highest | |
| Test Parameters for Channel Bandwidths | | | | | | |
| Test ID | Freq | ChBw | SCS | Downlink Configuration | Uplink Configuration | |
|  |  | Default | Default | N/A for Spectrum Emission Mask test case | Modulation (NOTE 2) | RB allocation (NOTE 1) |
| 13 | Low |  |  | DFT-s-OFDM PI/2 BPSK | Edge\_1RB\_Left |
| 23 | High |  |  | DFT-s-OFDM PI/2 BPSK | Edge\_1RB\_Right |
| 33 | Default |  |  | DFT-s-OFDM PI/2 BPSK | Outer\_Full |
| 44 | Low |  |  |  | DFT-s-OFDM PI/2 BPSK | Edge\_1RB\_Left |
| 54 | High |  |  |  | DFT-s-OFDM PI/2 BPSK | Edge\_1RB\_Right |
| 64 | Default |  |  |  | DFT-s-OFDM PI/2 BPSK | Outer\_Full |
| 7 | Low |  |  |  | DFT-s-OFDM QPSK | Edger\_1RB\_Left |
| 8 | High |  |  | DFT-s-OFDM QPSK | Edge\_1RB\_Right |
| 9 | Default |  |  | DFT-s-OFDM QPSK | Outer\_Full |
| 10 | Low |  |  | DFT-s-OFDM 16 QAM | Edge\_1RB\_Left |
| 11 | High |  |  | DFT-s-OFDM 16 QAM | Edge\_1RB\_Right |
| 12 | Default |  |  | DFT-s-OFDM 16 QAM | Outer\_Full |
| 13 | Low |  |  | DFT-s-OFDM 64 QAM | Edge\_1RB\_Left |
| 14 | High |  |  | DFT-s-OFDM 64 QAM | Edge\_1RB\_Right |
| 15 | Default |  |  | DFT-s-OFDM 64 QAM | Outer\_Full |
| 16 | Low |  |  | DFT-s-OFDM 256 QAM | Edge\_1RB\_Left |
| 17 | High |  |  | DFT-s-OFDM 256 QAM | Edge\_1RB\_Right |
| 18 | Default |  |  | DFT-s-OFDM 256 QAM | Outer\_Full |
| 19 | Low |  |  | CP-OFDM QPSK | Edge\_1RB\_Left |
| 20 | High |  |  | CP-OFDM QPSK | Edge\_1RB\_Right |
| 21 | Default |  |  | CP-OFDM QPSK | Outer\_Full |
| 22 | Low |  |  | CP-OFDM 16 QAM | Edge\_1RB\_Left |
| 23 | High |  |  | CP-OFDM 16 QAM | Edge\_1RB\_Right |
| 24 | Default |  |  | CP-OFDM 16 QAM | Outer\_Full |
| 25 | Low |  |  | CP-OFDM 64 QAM | Edge\_1RB\_Left |
| 26 | High |  |  | CP-OFDM 64 QAM | Edge\_1RB\_Right |
| 27 | Default |  |  | CP-OFDM 64 QAM | Outer\_Full |
| 28 | Low |  |  | CP-OFDM 256 QAM | Edge\_1RB\_Left |
| 29 | High |  |  | CP-OFDM 256 QAM | Edge\_1RB\_Right |
| 30 | Default |  |  | CP-OFDM 256 QAM | Outer\_Full |
| 315,6 | Low |  |  |  | DFT-s-OFDM Pi/2 BPSK w Pi/2 BPSK DMRS | Edge\_1RB\_Left |
| 325,6 | High |  |  |  | DFT-s-OFDM Pi/2 BPSK w Pi/2 BPSK DMRS | Edge\_1RB\_Right |
| 335,6 | Default |  |  |  | DFT-s-OFDM Pi/2 BPSK w Pi/2 BPSK DMRS | Outer Full |
| NOTE 1: The specific configuration of each RF allocation is defined in Table 6.1-1.  NOTE 2: DFT-s-OFDM PI/2 BPSK test applies only for UEs which supports half Pi BPSK in FR1.  NOTE 3: UE operating in TDD mode with Pi/2 BPSK modulation and UE indicates support for UE capability *powerBoosting-pi2BPSK* and the IE *powerBoostPi2BPSK* is set to 1 for bands n40, n41, n77, n78 and n79.  NOTE 4: UE operating in FDD mode, or in TDD mode in bands other than n40, n41, n77, n78 and n79, or in TDD mode the IE *powerBoostPi2BPSK* is set to 0 for bands n40, n41, n77, n78 and n79.  NOTE 5: For Power Class 3 testing, UE operating in FDD mode, or in TDD mode in bands other than n40, n41, n77, n78 and n79, or in TDD mode the IE *powerBoostPi2BPSK* is set to 0 for bands n40, n77, n78 and n79.  NOTE 6: Applicable to UEs indicating support for UE capability *lowPAPR-DMRS-PUSCHwithPrecoding-r16*. | | | | | | |

Table 6.5.2.2.4.1-2: Test Configuration Table for power class 2 (contiguous allocation)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Initial Conditions | | | | |
| Test Environment as specified in TS 38.508-1 [5] subclause 4.1 | | | Normal | |
| Test Frequencies as specified in TS 38.508-1 [5] subclause 4.3.1 | | | Low range, High range | |
| Test Channel Bandwidths as specified in TS 38.508-1 [5] subclause 4.3.1 | | | Lowest, Highest | |
| Test SCS as specified in Table 5.3.5-1 | | | Lowest, Highest | |
| Test Parameters for Channel Bandwidths | | | | |
| Test ID | Freq | Downlink Configuration | Uplink Configuration | |
|  |  | N/A | Modulation (NOTE 2) | RB allocation (NOTE 1) |
| 1 | Low |  | DFT-s-OFDM Pi/2 BPSK | Edge\_1RB\_Left |
| 2 | High |  | DFT-s-OFDM Pi/2 BPSK | Edge\_1RB\_Right |
| 3 | Default |  | DFT-s-OFDM Pi/2 BPSK | Outer Full |
| 4 | Low |  | DFT-s-OFDM QPSK | Edge\_1RB\_Left |
| 5 | High |  | DFT-s-OFDM QPSK | Edge\_1RB\_Right |
| 6 | Default |  | DFT-s-OFDM QPSK | Outer Full |
| 7 | Low |  | DFT-s-OFDM 16 QAM | Edge\_1RB\_Left |
| 8 | High |  | DFT-s-OFDM 16 QAM | Edge\_1RB\_Right |
| 9 | Default |  | DFT-s-OFDM 16 QAM | Outer Full |
| 10 | Low |  | DFT-s-OFDM 64 QAM | Edge\_1RB\_Left |
| 11 | High |  | DFT-s-OFDM 64 QAM | Edge\_1RB\_Right |
| 12 | Default |  | DFT-s-OFDM 64 QAM | Outer Full |
| 13 | Low |  | DFT-s-OFDM 256 QAM | Edge\_1RB\_Left |
| 14 | High |  | DFT-s-OFDM 256 QAM | Edge\_1RB\_Right |
| 15 | Default |  | DFT-s-OFDM 256 QAM | Outer Full |
| 16 | Low |  | CP-OFDM QPSK | Edge\_1RB\_Left |
| 17 | High |  | CP-OFDM QPSK | Edge\_1RB\_Right |
| 18 | Default |  | CP-OFDM QPSK | Outer Full |
| 19 | Low |  | CP-OFDM 16 QAM | Edge\_1RB\_Left |
| 20 | High |  | CP-OFDM 16 QAM | Edge\_1RB\_Right |
| 21 | Default |  | CP-OFDM 16 QAM | Outer Full |
| 22 | Low |  | CP-OFDM 64 QAM | Edge\_1RB\_Left |
| 23 | High |  | CP-OFDM 64 QAM | Edge\_1RB\_Right |
| 24 | Default |  | CP-OFDM 64 QAM | Outer Full |
| 25 | Low |  | CP-OFDM 256 QAM | Edge\_1RB\_Left |
| 26 | High |  | CP-OFDM 256 QAM | Edge\_1RB\_Right |
| 27 | Default |  | CP-OFDM 256 QAM | Outer Full |
| NOTE 1: The specific configuration of each RB allocation is defined in Table 6.1-1.  NOTE 2: DFT-s-OFDM Pi/2 BPSK test applies only for UEs which supports half Pi BPSK in FR1.  NOTE 3: It is essential that all test points in this table also exist in table 6.2.2.4.1-2. | | | | |

Table 6.5.2.2.4.1-2a: Test Configuration Table for power class 1 for Band n14 (contiguous allocation)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Initial Conditions | | | | |
| Test Environment as specified in TS 38.508-1 [5] subclause 4.1 | | | Normal | |
| Test Frequencies as specified in TS 38.508-1 [5] subclause 4.3.1 | | | Low range, High range | |
| Test Channel Bandwidths as specified in TS 38.508-1 [5] subclause 4.3.1 | | | Lowest, Highest | |
| Test SCS as specified in Table 5.3.5-1 | | | Lowest, Highest | |
| Test Parameters for Channel Bandwidths | | | | |
| Test ID | Freq | Downlink Configuration | Uplink Configuration | |
|  |  | N/A for Spectrum Emission Mask test case | Modulation (NOTE 2) | RB allocation (NOTE 1) |
| 1 | Default | DFT-s-OFDM Pi/2 BPSK | Inner Full |
| 2 | Low | DFT-s-OFDM Pi/2 BPSK | Edge\_1RB\_Left |
| 3 | High | DFT-s-OFDM Pi/2 BPSK | Edge\_1RB\_Right |
| 4 | Default | DFT-s-OFDM Pi/2 BPSK | Outer Full |
| 5 | Default | DFT-s-OFDM QPSK | Inner Full |
| 6 | Low | DFT-s-OFDM QPSK | Edge\_1RB\_Left |
| 7 | High | DFT-s-OFDM QPSK | Edge\_1RB\_Right |
| 8 | Default | DFT-s-OFDM QPSK | Outer Full |
| 9 | Default | DFT-s-OFDM 16 QAM | Inner Full |
| 10 | Low | DFT-s-OFDM 16 QAM | Edge\_1RB\_Left |
| 11 | High | DFT-s-OFDM 16 QAM | Edge\_1RB\_Right |
| 12 | Default | DFT-s-OFDM 16 QAM | Outer Full |
| 13 | Low | DFT-s-OFDM 64 QAM | Edge\_1RB\_Left |
| 14 | High | DFT-s-OFDM 64 QAM | Edge\_1RB\_Right |
| 15 | Default | DFT-s-OFDM 64 QAM | Outer Full |
| 16 | Low | DFT-s-OFDM 256 QAM | Edge\_1RB\_Left |
| 17 | High | DFT-s-OFDM 256 QAM | Edge\_1RB\_Right |
| 18 | Default | DFT-s-OFDM 256 QAM | Outer Full |
| 19 | Default | CP-OFDM QPSK | Inner Full |
| 20 | Low | CP-OFDM QPSK | Edge\_1RB\_Left |
| 21 | High | CP-OFDM QPSK | Edge\_1RB\_Right |
| 22 | Default | CP-OFDM QPSK | Outer Full |
| 23 | Default | CP-OFDM 16 QAM | Inner Full |
| 24 | Low | CP-OFDM 16 QAM | Edge\_1RB\_Left |
| 25 | High | CP-OFDM 16 QAM | Edge\_1RB\_Right |
| 26 | Default | CP-OFDM 16 QAM | Outer Full |
| 27 | Low | CP-OFDM 64 QAM | Edge\_1RB\_Left |
| 28 | High | CP-OFDM 64 QAM | Edge\_1RB\_Right |
| 29 | Default | CP-OFDM 64 QAM | Outer Full |
| 30 | Low | CP-OFDM 256 QAM | Edge\_1RB\_Left |
| 31 | High | CP-OFDM 256 QAM | Edge\_1RB\_Right |
| 32 | Default | CP-OFDM 256 QAM | Outer Full |
| 333 | Low | DFT-s-OFDM Pi/2 BPSK w Pi/2 BPSK DMRS | Edge\_1RB\_Left |
| 343 | High | DFT-s-OFDM Pi/2 BPSK w Pi/2 BPSK DMRS | Edge\_1RB\_Right |
| 353 | Default |  | DFT-s-OFDM Pi/2 BPSK w Pi/2 BPSK DMRS | Outer Full |
| NOTE 1: The specific configuration of each RB allocation is defined in Table 6.1-1.  NOTE 2: DFT-s-OFDM Pi/2 BPSK test applies only for UEs which supports half Pi BPSK in FR1.  NOTE 3: Applicable to UEs indicating support for UE capability *lowPAPR-DMRS-PUSCHwithPrecoding-r16*.  NOTE 4: It is essential that all test points in this table also exist in table 6.2.2.4.1-2. | | | | |

Table 6.5.2.2.4.1-3: Test Configuration Table for power class 2&3 (almost contiguous allocation)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Initial Conditions | | | | |
| Test Environment as specified in TS 38.508-1 [5] subclause 4.1 | | | Normal | |
| Test Frequencies as specified in TS 38.508-1 [5] subclause 4.3.1 | | | Low range, High range | |
| Test Channel Bandwidths as specified in TS 38.508-1 [5] subclause 4.3.1 | | | Highest | |
| Test SCS as specified in Table 5.3.5-1 | | | Lowest, Highest | |
| Test Parameters for Channel Bandwidths | | | | |
| Test ID | Freq | Downlink Configuration | Uplink Configuration | |
|  |  | N/A | Modulation | RB allocation (NOTE 1) |
| 1 | Default |  | CP-OFDM QPSK | Inner Full |
| 2 | Default |  | CP-OFDM QPSK | Outer Full |
| 3 | Default |  | CP-OFDM 16 QAM | Inner Full |
| 4 | Default |  | CP-OFDM 16 QAM | Outer Full |
| 5 | Default |  | CP-OFDM 64 QAM | Outer Full |
| 6 | Default |  | CP-OFDM 256 QAM | Outer Full |
| NOTE 1: The specific configuration of each RB allocation is defined in Tables 6.2.2.4.1-4, 6.2.2.4.1-4a and 6.2.2.4.1-4b.  NOTE 2: It is essential that all test points in this table also exist in table 6.2.2.4.1-3.  NOTE 3: Test applies only for UEs which support almost contiguous UL CP-OFDM transmissions. For PC2 UE which support almost contiguous UL CP-OFDM transmissions, test is only applicable for Release 16 and forward. | | | | |

1. Connect the SS to the UE antenna connectors as shown in TS 38.508-1 [5] Annex A, Figure A.3.1.1.1 for TE diagram and section A.3.2 for UE diagram.

2. The parameter settings for the cell are set up according to TS 38.508-1 [5] subclause 4.4.3.

3. Downlink signals are initially set up according to Annex C.0, C.1, C.2 and uplink signals according to Annex G.0, G.1, G.2, G.3.0.

4. The UL Reference Measurement channels are set according to Table 6.5.2.2.4.1-1.

5. Propagation conditions are set according to Annex B.0.

6. Ensure the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On,* Test Mode *On* and Test Loop Function *On* according to TS 38.508-1 [5] clause 4.5. Message contents are defined in clause 6.5.2.2.4.3.

6.5.2.2.4.2 Test procedure

1. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0\_1 for C\_RNTI to schedule the UL RMC according to Table 6.5.2.2.4.1-1, Table 6.5.2.2.4.1-2, Table 6.5.2.2.4.1-2a and Table 6.5.2.2.4.1-3. Since the UL has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC.

2. Send continuously power control “up” commands to the UE until the UE transmits at PUMAX level. Allow at least 200ms for the UE to reach PUMAX level.

3. Measure the mean power of the UE in the channel bandwidth of the radio access mode according to the test configuration, which shall meet the requirements described in Table 6.2.2.5-1 to 6.2.2.5-9. The period of the measurement shall be at least the continuous duration of 1ms over consecutive active uplink slots. For TDD, only slots consisting of only UL symbols are under test.

4. Measure the power of the transmitted signal with a measurement filter of bandwidths according to table 6.5.2.2.5-1 and using a rms detector. If the sweep count is higher than one, the trace mode shall be average. The centre frequency of the filter shall be stepped in continuous steps according to the same table. The measured power shall be recorded for each step. The measurement period shall capture the active TSs.

NOTE 1: When switching to DFT-s-OFDM waveform, as specified in the test configuration table 6.5.2.2.4.1-1, table 6.5.2.2.4.1-2, and table 6.5.2.2.4.1-2a, send an NR RRCReconfiguration message according to TS 38.508-1 [5] clause 4.6.3 Table 4.6.3-118 PUSCH-Config with TRANSFORM\_PRECODER\_ENABLED condition.

6.5.2.2.4.3 Message contents

Message contents are according to TS 38.508-1 [5] subclause 4.6 with the following exceptions:

Table 6.5.2.2.4.3-1: *PUSCH-Config*

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [5] subclause 4.6.3 Table 4.6.3-118 PUSCH-Config | | | |
| Information Element | Value/remark | Comment | Condition |
| PUSCH-Config ::= SEQUENCE { |  |  |  |
| resourceAllocation | resourceAllocationType0 |  | Almost contiguous allocation |
|  | resourceAllocationType1 |  | Contiguous allocation |
| } |  |  |  |

Table 6.5.2.2.4.3-2: DMRS-UplinkConfig (Test ID 28 – 30 in Table 6.5.2.2.4.1-1)

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [5], Table 4.6.3-51 | | | |
| Information Element | Value/remark | Comment | Condition |
| DMRS-UplinkConfig ::= SEQUENCE { |  |  |  |
| transformPrecodingEnabled SEQUENCE { |  |  |  |
| dmrs-UplinkTransformPrecoding-r16 SEQUENCE { |  |  |  |
| pi2BPSK-ScramblingID0 | Not present |  |  |
| pi2BPSK-ScramblingID1 | Not present |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |

6.5.2.2.5 Test requirement

The measured UE mean power in the channel bandwidth, derived in step 3, shall fulfil requirements in Tables 6.2.2.5-1 to 6.2.2.5-9 as appropriate, and the power of any UE emission shall fulfil requirements in Table 6.5.2.2.5-1.

Table 6.5.2.2.5-1: General NR spectrum emission mask

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| ΔfOOB  (MHz) | Channel bandwidth (MHz) / Spectrum emission limit (dBm) | | | Measurement bandwidth |
| 5 | 10, 15, 20, 25, 30, 35, 40, 45 | 50, 60, 70, 80, 90, 100 |
| ± 0-1 | -13 + TT | -13 + TT |  | 1 % of channel BW |
| ± 0-1 |  |  | -24 + TT | 30 kHz |
| ± 1-5 | -10 + TT | -10 + TT | | 1 MHz |
| ± 5-6 | -13 + TT |  | |
| ± 6-10 | -25 + TT |  | |
| ± 5-BWChannel |  | -13 + TT | |
| ± BWChannel-(BWChannel+5) |  | -25 + TT | |
| Note 1: The first and last measurement position with a 30 kHz filter is at ΔfOOB equals to 0.015 MHz and 0.985 MHz.  Note 2: At the boundary of spectrum emission limit, the first and last measurement position with a 1 MHz filter is the inside of +0.5MHz and -0.5MHz, respectively.  Note 3: The measurements are to be performed above the upper edge of the channel and below the lower edge of the channel.  Note 4: TT for each frequency and channel bandwidth is specified in Table 6.5.2.2.5-2. | | | | |

Table 6.5.2.2.5-2: Test Tolerance (Spectrum Emission Mask)

|  |  |  |  |
| --- | --- | --- | --- |
|  | f ≤ 3.0GHz | 3.0GHz < f ≤ 4.2GHz | 4.2GHz < f ≤ 6.0GHz |
| BW ≤ 100MHz | 1.5 dB | 1.8 dB | 1.8 dB |

NOTE: As a general rule, the resolution bandwidth of the measuring equipment should be equal to the measurement bandwidth. However, to improve measurement accuracy, sensitivity and efficiency, the resolution bandwidth may be smaller than the measurement bandwidth. When the resolution bandwidth is smaller than the measurement bandwidth, the result should be integrated over the measurement bandwidth in order to obtain the equivalent noise bandwidth of the measurement bandwidth.

#### 6.5.2.3 Additional spectrum emission mask

6.5.2.3.1 Test purpose

To verify that the power of any UE emission shall not exceed specified level for the specified channel bandwidth under the deployment scenarios where additional requirements are specified.

6.5.2.3.2 Test applicability

This test case applies to all types of NR Power Class 1 UE release 15 and forward.

This test case applies to all types of NR Power Class 2 and Power Class 3 UE release 15 and forward that don’t support Tx diversity.

6.5.2.3.3 Minimum conformance requirements

6.5.2.3.3.1 Minimum requirement for "NS\_35"

Additional spectrum emission requirements are signalled by the network to indicate that the UE shall meet an additional requirement for a specific deployment scenario as part of the cell handover/broadcast message.

When " NS\_35" is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 6.5.2.2.3.3.1-1.

Table 6.5.2.2.3.3.1-1: Additional requirements for “NS\_35”

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Spectrum emission limit (dBm) / Channel bandwidth | | | | | |
| ΔfOOB  (MHz) | 5  MHz | 10  MHz | 15 MHz | 20 MHz | Measurement bandwidth (unless otherwise stated) |
| ± 0-0.1 | -15 | -18 | -20 | -21 | 30 kHz |
| ± 0.1-6 | -13 | -13 | -13 | -13 | 100 kHz |
| ± 6-10 | -251 | -13 | -13 | -13 | 100 kHz |
| ± 10-15 |  | -251 | -13 | -13 | 100 kHz |
| ± 15-20 |  |  | -251 | -13 | 100 kHz |
| ± 20-25 |  |  |  | -25 | 1 MHz |
| NOTE 1: The measurement bandwidth shall be 1 MHz | | | | | |

NOTE: As a general rule, the resolution bandwidth of the measuring equipment should be equal to the measurement bandwidth. However, to improve measurement accuracy, sensitivity and efficiency, the resolution bandwidth may be smaller than the measurement bandwidth. When the resolution bandwidth is smaller than the measurement bandwidth, the result should be integrated over the measurement bandwidth in order to obtain the equivalent noise bandwidth of the measurement bandwidth.

The normative reference for this requirement is TS 38.101-1 [2] clause 6.5.2.3.1.

6.5.2.3.3.2 Requirements for network signalling value "NS\_04"

Additional spectrum emission requirements are signalled by the network to indicate that the UE shall meet an additional requirement for a specific deployment scenario as part of the cell handover/broadcast message.

The n41 SEM transition point from -13 dBm/MHz to -25 dBm/MHz is based on the emission bandwidth. The emission bandwidth is defined as the width of the signal between two points, one below the carrier centre frequency and one above the carrier c frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power. Since the 26-dB emission bandwidth is implementation dependent, the maximum transmission bandwidths in MHz (NRB \* SCS \* 12 / 1,000) is used for the SEM.

Table 6.5.2.3.3.2-1: n41 maximum transmission bandwidths (MHz) for CP-OFDM

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| SCS (kHz) | Channel bandwidths (MHz) / Maximum transmission bandwidth (MHz) | | | | | | | | | | |
| 10 | 15 | 20 | 30 | 40 | 50 | 60 | 70 | 80 | 90 | 100 |
| 15 | 9.36 | 14.22 | 19.08 | 28.80 | 38.88 | 48.6 | N/A | N/A | N/A | N/A | N/A |
| 30 | 8.64 | 13.68 | 18.36 | 28.08 | 38.16 | 47.88 | 58.32 | 68.04 | 78.12 | 88.02 | 98.28 |
| 60 | 7.92 | 12.96 | 17.28 | 27.36 | 36.72 | 46.8 | 56.88 | 66.96 | 77.04 | 87.12 | 97.20 |

Table 6.5.2.3.3.2-2: n41 maximum transmission bandwidths (MHz) for DFT-S-OFDM

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| SCS (kHz) | Channel bandwidths (MHz) / Maximum transmission bandwidth (MHz) | | | | | | | | | | |
| 10 | 15 | 20 | 30 | 40 | 50 | 60 | 70 | 80 | 90 | 100 |
| 15 | 9.00 | 13.50 | 18.00 | 28.80 | 38.88 | 48.60 | N/A | N/A | N/A | N/A | N/A |
| 30 | 8.64 | 12.96 | 18.00 | 27.00 | 36.00 | 46.08 | 58.32 | 64.80 | 77.76 | 87.48 | 97.20 |
| 60 | 7.20 | 12.96 | 17.28 | 25.92 | 36.00 | 46.08 | 54.00 | 64.80 | 72.00 | 86.40 | 97.20 |

When "NS\_04" is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 6.5.2.3.3.2-3.

Table 6.5.2.3.3.2-3: n41 SEM with “NS\_04”

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| ΔfOOB  MHz |  | Channel bandwidth (MHz) / Spectrum emission limit (dBm) | | | | | | | | | | Measurement bandwidth |
|  | 10 | 15 | 20 | 30 | 40 | 50 | 60 | 70 | 80 | 90 | 100 |  |
| ± 0 - 1 | -10 | -10 | -10 | -10 | -10 |  |  | | | | | 2 % channel bandwidth |
|  |  |  |  |  |  |  | -10 | | | | | 1 MHz |
| ± 1 - 5 |  | -10 | | | | | | | | | | 1 MHz |
| ± 5 - X |  | -13 | | | | | | | | | |
| ± X - (BWChannel + 5 MHz) |  | -25 | | | | | | | | | |
| NOTE: X is defined in Table 6.5.2.3.3.2-1 for CP-OFDM and 6.5.2.3.3.2-2 for DFT-S-OFDM | | | | | | | | | | | | |

The normative reference for this requirement is TS 38.101-1 [2] clause 6.5.2.3.2.

6.5.2.3.3.3 Requirements for network signalling value "NS\_03" and "NS\_03U"

Additional spectrum emission requirements are signalled by the network to indicate that the UE shall meet an additional requirement for a specific deployment scenario as part of the cell handover/broadcast message.

When "NS\_03" or "NS\_03U", is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 6.5.2.3.3.3-1.

Table 6.5.2.3.3.3-1: Additional requirements for "NS\_03" and "NS\_03U"

|  |  |  |  |
| --- | --- | --- | --- |
| **ΔfOOB  MHz** | **Channel bandwidth (MHz) / Spectrum emission limit (dBm)** | | **Measurement bandwidth** |
|  | **5** | **10, 15, 20, 25, 30, 35, 40, 45** |  |
| ± 0-1 | -13 | -13 | 1 % of channel BW |
| ± 1-6 | -13 | -13 | 1 MHz |
| ± 6-10 | -25 |
| ± 1-BWChannel |  |
| ± BWChannel-(BWChannel+5) |  | -25 |

NOTE: As a general rule, the resolution bandwidth of the measuring equipment should be equal to the measurement bandwidth. However, to improve measurement accuracy, sensitivity and efficiency, the resolution bandwidth may be smaller than the measurement bandwidth. When the resolution bandwidth is smaller than the measurement bandwidth, the result should be integrated over the measurement bandwidth in order to obtain the equivalent noise bandwidth of the measurement bandwidth.

The normative reference for this requirement is TS 38.101-1 [2] clause 6.5.2.3.3.

6.5.2.3.3.4 Requirements for network signalling value "NS\_06" or "NS\_07"

Additional spectrum emission requirements are signalled by the network to indicate that the UE shall meet an additional requirement for a specific deployment scenario as part of the cell handover/broadcast message.

When "NS\_06" or "NS\_07" is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 6.5.2.3.3.4-1.

Table 6.5.2.3.3.4-1: Additional requirements for "NS\_06" or "NS\_07"

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| ΔfOOB  (MHz) | Channel bandwidth (MHz) / Spectrum emission limit (dBm) | | | Measurement  bandwidth |
|  | 5 | 10 | 15 |  |
| ± 0 – 0.1 | -15 | -18 | -20 | 30 kHz |
| ± 0.1 – 1 | -13 | -13 | -13 | 100 kHz |
| ± 1 – 6 | -13 | -13 | -13 | 1 MHz |
| ± 6 – 10 | -25 |
| ± 10 – 15 |  | -25 |
| ± 15 – 20 |  |  | -25 |

NOTE: As a general rule, the resolution bandwidth of the measuring equipment should be equal to the measurement bandwidth. However, to improve measurement accuracy, sensitivity and efficiency, the resolution bandwidth may be smaller than the measurement bandwidth. When the resolution bandwidth is smaller than the measurement bandwidth, the result should be integrated over the measurement.

The normative reference for this requirement is TS 38.101-1 [2] clause 6.5.2.3.4.

6.5.2.3.3.5 Void

6.5.2.3.3.6 Void

6.5.2.3.3.7 Void

6.5.2.3.3.8 Requirements for network signalling value "NS\_27"

Additional spectrum emission requirements are signalled by the network to indicate that the UE shall meet an additional requirement for a specific deployment scenario as part of the cell handover/broadcast message.

When "NS\_27" is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 6.5.2.3.3.8-1.

Table 6.5.2.3.3.8-1: Additional requirements for "NS\_27"

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| ΔfOOB  MHz | Channel bandwidth (MHz) / Spectrum emission limit (dBm) | | | | | | Measurement bandwidth |
| 5 | 10 | 15 | 20 | 30 | 40 |
| ± 0 - 1 | -13 | | | | | | 1 % channel bandwidth |
| ± 1 - X | -13 | | | | | | 1 MHz |
| < – X or > X | -25 | | | | | |
| NOTE 1: X is occupied channel bandwidth as defined in Table 6.5.1.3-1.  NOTE 2: The requirements apply only at the frequency range from 3540 MHz to 3710 MHz. | | | | | | | |

NOTE: As a general rule, the resolution bandwidth of the measuring equipment should be equal to the measurement bandwidth. However, to improve measurement accuracy, sensitivity and efficiency, the resolution bandwidth may be smaller than the measurement bandwidth. When the resolution bandwidth is smaller than the measurement bandwidth, the result should be integrated over the measurement.

The normative reference for this requirement is TS 38.101-1 [2] clause 6.5.2.3.8.

6.5.2.3.3.9 Requirements for network signalling value "NS\_21"

Additional spectrum emission requirements are signalled by the network to indicate that the UE shall meet an additional requirement for a specific deployment scenario as part of the cell handover/broadcast message.

When "NS\_21" is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 6.5.2.3.3.9-1.

Table 6.5.2.3.3.9-1: Additional requirements for "NS\_21" (applicable to UEs Release 17 and forward indicating *modifiedMPR-Behavior)*

|  |  |  |  |
| --- | --- | --- | --- |
| **ΔfOOB  MHz** | **Channel bandwidth (MHz) / Spectrum emission limit (dBm)** | | **Measurement bandwidth** |
|  | **5** | **10** |  |
| ± 0-1 | -13 | -13 | 1 MHz |
| ± 1-6 | -13 | -13 | 1 MHz |
| ± 6-10 | -25 | -13 | 1 MHz |
| ± 10-15 |  | -25 | 1 MHz |

NOTE: As a general rule, the resolution bandwidth of the measuring equipment should be equal to the measurement bandwidth. However, to improve measurement accuracy, sensitivity and efficiency, the resolution bandwidth may be smaller than the measurement bandwidth. When the resolution bandwidth is smaller than the measurement bandwidth, the result should be integrated over the measurement bandwidth in order to obtain the equivalent noise bandwidth of the measurement bandwidth.

6.5.2.3.4 Test description

6.5.2.3.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, test channel bandwidths and sub-carrier spacing based on NR operating bands specified in table 5.3.5-1. All of these configurations shall be tested with applicable test parameters for each combination of test channel bandwidth and sub-carrier spacing, and are shown in clause 6.2.3.4.1. The details of the uplink reference measurement channels (RMCs) are specified in Annex A.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

1. Connect the SS to the UE antenna connectors as shown in TS 38.508-1 [5] Annex A, Figure A.3.1.1.1 for TE diagram and section A.3.2 for UE diagram.

2. The parameter settings for the cell are set up according to TS 38.508-1 [5] subclause 4.4.3.

3. Downlink signals are initially set up according to Annex C.0, C.1, C.2 and uplink signals according Annex G.0, G.1, G.2, G.3.0.

4. The UL Reference Measurement channels are set according to the applicable test configuration table in clause 6.2.3.4.1.

5. Propagation conditions are set according to Annex B.0.

6. Ensure the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On,* Test Mode *On* and Test Loop Function *On* according to TS 38.508-1 [5] clause 4.5. Message contents are defined in clause 6.5.2.3.4.3.

6.5.2.3.4.2 Test procedure

1. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0\_1 for C\_RNTI to schedule the UL RMC according to the applicable test configuration table in clause 6.2.3.4.1. Since the UE has no payload data to send, the UE transmits uplink MAC padding bits on the UL RMC.

2. Send continuously uplink power control "up" commands in the uplink scheduling information to the UE. Allow at least 200ms starting from the first TPC command in this step for the UE to reach PUMAX level.

3. Measure the mean power of the UE in the channel bandwidth of the radio access mode according to the test configuration, which shall meet the requirements described in applicable table from Table 6.2.3.5-1 to Table 6.2.3.5-35. The period of measurement shall be at least the continuous duration one sub-frame (1ms). For TDD slots with transient periods are not under test.

4. Measure the power of the transmitted signal with a measurement filter of bandwidths according to applicable test configuration tables in subclause 6.5.2.3.5 and using a rms detector. If the sweep count is higher than one, the trace mode shall be average. The centre frequency of the filter shall be stepped in continuous steps according to the applicable test requirement table. The measured power shall be recorded for each step. The measurement period shall capture the active TSs.

NOTE 1: When switching to DFT-s-OFDM waveform, as specified in the test configuration Table 6.2.3.4.1-1 through 6.2.3.4.1-2, send an NR RRCReconfiguration message according to TS 38.508-1 [5] clause 4.6.3 Table 4.6.3-118 PUSCH-Config with TRANSFORM\_PRECODER\_ENABLED condition.

6.5.2.3.4.3 Message contents

Message contents are according to TS 38.508-1 [5] subclause 4.6, with the following exceptions for each network signalling value.

6.5.2.3.4.3.1 Message contents exceptions (network signalling value "NS\_35")

For "NS\_35" see A-MPR test case in table 6.2.3.4.3.2-1.

6.5.2.3.4.3.2 Message contents exceptions (network signalling value "NS\_04")

For "NS\_04" see A-MPR test case in table 6.2.3.4.3.4-1.

6.5.2.3.4.3.3 Message contents exceptions (network signalling value "NS\_03")

For "NS\_03" see A-MPR test case in table 6.2.3.4.3.1-1.

6.5.2.3.4.3.4 Message contents exceptions (network signalling value "NS\_03U")

For "NS\_03U" see A-MPR test case in table 6.2.3.4.3.3-1.

6.5.2.3.4.3.5 Message contents exceptions (network signalling value "NS\_06") or "NS\_07"

For "NS\_06" see A-MPR test case in table 6.2.3.4.3.7-1. For "NS\_07" see A-MPR test case in table 6.2.3.4.3.35-1

6.5.2.3.4.3.6 Message contents exceptions (network signalling value "NS\_21")

For "NS\_21" see A-MPR test case in table 6.2.3.4.3.20-1.

6.5.2.3.4.3.7 Message contents exceptions (network signalling value "NS\_27")

For "NS\_27" see A-MPR test case in table 6.2.3.4.3.22-1.

6.5.2.3.5 Test requirement

Table 6.5.2.3.5-1: Test Tolerance (Additional spectrum emission mask)

|  |  |  |  |
| --- | --- | --- | --- |
|  | f ≤ 3.0GHz | 3.0GHz < f ≤ 4.2GHz | 4.2GHz < f ≤ 6.0GHz |
| BW ≤ 100MHz | 1.5 dB | 1.8 dB | 1.8 dB |

6.5.2.3.5.1 Test requirements (network signalling value "NS\_35")

When "NS\_35" is indicated in the cell:

- the measured UE mean power in the channel bandwidth, derived in step 3, shall fulfil requirements in table 6.2.3.5-1 as appropriate for a NR UE.

and

- the power of any UE emission shall fulfil requirements in table 6.5.2.3.5.1-1, as applicable.

Table 6.5.2.3.5.1-1: Additional test requirements "NS\_35"

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Spectrum emission limit (dBm) / Channel bandwidth | | | | | |
| ΔfOOB  (MHz) | 5 MHz | 10 MHz | 15 MHz | 20 MHz | Measurement bandwidth (unless otherwise stated) |
| ± 0-0.1 | -15.0 + TT | -18.0 + TT | -20.0 + TT | -21.0 + TT | 30 kHz |
| ± 0.1-6 | -13.0 + TT- | -13.0 + TT | -13.0 + TT | -13.0 + TT | 100 kHz |
| ± 6-10 | -25 1 + TT | -13.0 + TT | -13.0 + TT | -13.0 + TT | 100 kHz |
| ± 10-15 |  | -251 0 + TT | -13.0 + TT | -13.0 + TT | 100 kHz |
| ± 15-20 |  |  | -25 10 + TT | -13.0 + TT | 100 kHz |
| ± 20-25 |  |  |  | -25 + TT | 1 MHz |
| NOTE 1: The measurement bandwidth shall be 1 MHz.  NOTE 2: TT for each frequency and channel bandwidth is specified in Table 6.5.2.3.5-1. | | | | | |

NOTE: As a general rule, the resolution bandwidth of the measuring equipment should be equal to the measurement bandwidth. However, to improve measurement accuracy, sensitivity and efficiency, the resolution bandwidth may be smaller than the measurement bandwidth. When the resolution bandwidth is smaller than the measurement bandwidth, the result should be integrated over the measurement bandwidth in order to obtain the equivalent noise bandwidth of the measurement bandwidth.

6.5.2.3.5.2 Test requirements (network signalling value "NS\_04")

When "NS\_04" is indicated in the cell:

- the measured UE mean power in the channel bandwidth, derived in step 3, shall fulfil requirements in Table 6.2.3.5-2 for UE power class 2 or Table 6.2.3.5-3 UE power class 3.

and

- the power of any UE emission shall fulfil requirements in table 6.5.2.3.5.2-1.

Table 6.5.2.3.5.2-1: Additional test requirements for "NS\_04"

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| ΔfOOB  MHz |  | Spectrum emission limit (dBm) / measurement bandwidth  for each channel bandwidth (MHz) | | | | | | | | | | | Measurement bandwidth |
|  | 10 | 15 | 20 | 30 | 40 | 50 | | 60 | 70 | 80 | 90 | 100 |  |
| ± 0 - 1 | -10+TT | -10+TT | -10+TT | -10+TT | -10+TT |  |  | | | | | | 2 % channel bandwidth |
|  |  |  |  |  |  |  | -10 | | | | | | 1 MHz |
| ± 1 - 5 |  | -10 + TT | | | | | | | | | | | 1 MHz |
| ± 5 - X |  | -13 + TT | | | | | | | | | | |
| ± X - (BWChannel + 5 MHz) |  | -25 + TT | | | | | | | | | | |
| NOTE 1: X is defined in Table 6.5.2.3.3.2-1 for CP-OFDM and 6.5.2.3.3.2-2 for DFT-S-OFDM.  NOTE 2: TT for each frequency and channel bandwidth is specified in Table 6.5.2.3.5-1. | | | | | | | | | | | | | |

6.5.2.3.5.3 Test requirements (network signalling value "NS\_03", "NS\_03U")

When "NS\_03" or "NS\_03U" is indicated in the cell:

- the measured UE mean power in the channel bandwidth, derived in step 3, shall fulfil requirements in table 6.2.3.5-4 or 6.2.3.5-5 as appropriate for a NR UE.

and

- the power of any UE emission shall fulfil requirements in table 6.5.2.3.5.3-1, as applicable.

Table 6.5.2.3.5.3-1: Additional requirements for "NS\_03", "NS\_03U"

|  |  |  |  |
| --- | --- | --- | --- |
| **ΔfOOB  MHz** | **Channel bandwidth (MHz) / Spectrum emission limit (dBm)** | | **Measurement bandwidth** |
|  | **5** | **10, 15, 20, 25, 30, 35, 40, 45** |  |
| ± 0-1 | -13 + TT | -13 + TT | 1 % of channel BW |
| ± 1-6 | -13 + TT | -13 + TT | 1 MHz |
| ± 6-10 | -25 + TT |
| ± 1-BWChannel |  |
| ± BWChannel-(BWChannel+5) |  | -25 + TT |
| NOTE 1: TT for each frequency and channel bandwidth is specified in Table 6.5.2.3.5-1. | | | |

NOTE: As a general rule, the resolution bandwidth of the measuring equipment should be equal to the measurement bandwidth. However, to improve measurement accuracy, sensitivity and efficiency, the resolution bandwidth may be smaller than the measurement bandwidth. When the resolution bandwidth is smaller than the measurement bandwidth, the result should be integrated over the measurement bandwidth in order to obtain the equivalent noise bandwidth of the measurement bandwidth.

6.5.2.3.5.4 Test requirements (network signalling value "NS\_06" or “NS\_07)

When "NS\_06" is indicated in the cell:

- the measured UE mean power in the channel bandwidth, derived in step 3, shall fulfil requirements in table 6.2.3.5-34 as appropriate for a NR UE

When "NS\_07 is indicated in the cell:

- the measured UE mean power in the channel bandwidth, derived in step 3, shall fulfil requirements in table 6.2.3.5-37 as appropriate for a NR UE

and

- the power of any UE emission shall fulfil requirements in table 6.5.2.3.5.4-1, as applicable.

Table 6.5.2.3.5.4-1: Additional requirements for "NS\_06" or "NS\_07"

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Spectrum emission limit (dBm) / Channel bandwidth | | | | |
| ΔfOOB  (MHz) | 5 MHz | 10 MHz | 15 MHz | Measurement  bandwidth |
| ± 0 – 0.1 | -15 + TT | -18 + TT | -20 + TT | 30 kHz |
| ± 0.1 – 1 | -13 + TT | -13 + TT | -13 + TT | 100 kHz |
| ± 1 – 6 | -13 + TT | -13 + TT | -13 + TT | 1 MHz |
| ± 6 – 10 | -25 + TT | -13 + TT | -13 + TT | 1 MHz |
| ± 10 – 15 |  | -25 + TT | -13 + TT | 1 MHz |
| ± 15 – 20 |  |  | -25 + TT | 1 MHz |
| NOTE 1: TT for each frequency and channel bandwidth is specified in Table 6.5.2.3.5-1. | | | | |

NOTE: As a general rule, the resolution bandwidth of the measuring equipment should be equal to the measurement bandwidth. However, to improve measurement accuracy, sensitivity and efficiency, the resolution bandwidth may be smaller than the measurement bandwidth. When the resolution bandwidth is smaller than the measurement bandwidth, the result should be integrated over the measurement bandwidth in order to obtain the equivalent noise bandwidth of the measurement bandwidth.

6.5.2.3.5.5 Void

6.5.2.3.5.6 Void

6.5.2.3.5.7 Void

6.5.2.3.5.8 FFS

6.5.2.3.5.9 Test requirements for network signalling value "NS\_21"

When "NS\_21" is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 6.5.2.3.5.9-1.

Table 6.5.2.3.5.9-1: Additional requirements for "NS\_21" (applicable to UEs Release 17 and forward indicating *modifiedMPR-Behavior)*

|  |  |  |  |
| --- | --- | --- | --- |
| **ΔfOOB  MHz** | **Channel bandwidth (MHz) / Spectrum emission limit (dBm)** | | **Measurement bandwidth** |
|  | **5** | **10** |  |
| ± 0-1 | -13+TT | -13+TT | 1 MHz |
| ± 1-6 | -13+TT | -13+TT | 1 MHz |
| ± 6-10 | -25+TT | -13+TT | 1 MHz |
| ± 10-15 |  | -25+TT | 1 MHz |

NOTE: As a general rule, the resolution bandwidth of the measuring equipment should be equal to the measurement bandwidth. However, to improve measurement accuracy, sensitivity and efficiency, the resolution bandwidth may be smaller than the measurement bandwidth. When the resolution bandwidth is smaller than the measurement bandwidth, the result should be integrated over the measurement bandwidth in order to obtain the equivalent noise bandwidth of the measurement bandwidth.

#### 6.5.2.4 Adjacent channel leakage ratio

Adjacent channel leakage power Ratio (ACLR) is the ratio of the filtered mean power centred on the assigned channel frequency to the filtered mean power centred on an adjacent channel frequency.

##### 6.5.2.4.1 NR ACLR

6.5.2.4.1.1 Test purpose

To verify that UE transmitter does not cause unacceptable interference to adjacent channels in terms of Adjacent Channel Leakage power Ratio (ACLR).

6.5.2.4.1.2 Test applicability

This test case applies to all types of NR Power Class 1 release 15 and forward.

This test case applies to all types of NR Power Class 2 and Power Class 3 UE release 15 and forward that don’t support Tx diversity.

6.5.2.4.1.3 Minimum conformance requirements

NR adjacent channel leakage power ratio (NRACLR) is the ratio of the filtered mean power centred on the assigned NR channel frequency to the filtered mean power centred on an adjacent NR channel frequency at nominal channel spacing.

The assigned NR channel power and adjacent NR channel power are measured with rectangular filters with measurement bandwidths specified in Table 6.5.2.4.1.3-1.

If the measured adjacent channel power is greater than –50dBm then the NRACLR shall be higher than the value specified in Table 6.5.2.4.1.3-2.

Table 6.5.2.4.1.3-1: NR ACLR measurement bandwidth

|  |  |  |  |
| --- | --- | --- | --- |
| Channel bandwidth | (MHz) | 5,10,15,20,25,30,35,40,45,50 | 60,70,80,90,100 |
| REF\_SCS | (kHz) | 15 | 30 |
| NR ACLR measurement bandwidth | (MHz) | MBW=REF\_SCS\*(12\*NRB+1)/1000 | |
| NOTE: “NRB” in the formula is the maximum transmission bandwidth configuration as defined in Table 5.3.2-1. | | | |

Table 6.5.2.4.1.3-2: NR ACLR requirement

|  |  |  |  |
| --- | --- | --- | --- |
|  | Power class 11 | Power class 2 | Power class 3 |
| NR ACLR | 37 dB1 | 31 dB | 30 dB |
| NOTE 1: Applicable for power class 1 UE operating in Band n14. | | | |

The normative reference for this requirement is TS 38.101-1 [2] clause 6.5.2.4.1.

6.5.2.4.1.4 Test description

6.5.2.4.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, test channel bandwidths and sub-carrier spacing based on NR operating bands specified in Table 5.3.5-1. All of these configurations shall be tested with applicable test parameters for each combination of channel bandwidth and sub-carrier spacing, are shown in the test configuration tables in clause 6.2.2.4.1. The details of the uplink reference measurement channels (RMCs) are specified in Annexes A.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2

Table 6.5.2.4.1.4.1-1: Void

Table 6.5.2.4.1.4.1-2: Void

Table 6.5.2.4.1.4.1-2a: Void

Table 6.5.2.4.1.4.1-3: Void

Table 6.5.2.4.1.4.1-4: Void

1. Connect the SS to the UE antenna connectors as shown in TS 38.508-1 [5] Annex A, Figure A.3.1.1.1 for TE diagram and section A.3.2 for UE diagram.

2. The parameter settings for the cell are set up according to TS 38.508-1 [5] subclause 4.4.3.

3. Downlink signals are initially set up according to Annex C.0, C.1, C.2, and uplink signals according to Annex G.0, G.1, G.2, G.3.0.

4. The UL Reference Measurement channels are set according to the test configuration tables in clause 6.2.2.4.1.

5. Propagation conditions are set according to Annex B.0.

6. Ensure the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On,* Test Mode *On* and Test Loop Function *On* according to TS 38.508-1 [5] clause 4.5. Message contents are defined in clause 6.5.2.4.1.4.3.

6.5.2.4.1.4.2 Test procedure

1. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0\_1 for C\_RNTI to schedule the UL RMC according to the test configuration tables in clause 6.2.2.4.1T. Since the UL has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC.

2. Send continuously power control “up” commands to the UE until the UE transmits at PUMAX level. Allow at least 200ms for the UE to reach PUMAX level.

3. Measure the mean power of the UE in the channel bandwidth of the radio access mode according to the test configuration, as measured in step 3of 6.2.2.4.2, which shall meet the requirements described in clause 6.2.2.5 as appropriate.

4. Measure the rectangular filtered mean power for the assigned NR channel using a rms detector. If the sweep count is higher than one, the trace mode shall be average.

5. Measure the rectangular filtered mean power of the first NR adjacent channel on both lower and upper side of the assigned NR channel using a rms detector, respectively. If the sweep count is higher than one, the trace mode shall be average.

6. Calculate the ratios of the power between the values measured in step 4 over step 5 for lower and upper NR ACLR, respectively.

7. For UEs supporting Power Class 1 in Band n14 and Power Class 2, repeat steps 1~6 for Test ID 22 and 36 in Table 6.2.2.4.1-1 on the applicable bands with message exception of P-Max defined in Table 6.5.2.4.1.4.3-1.

NOTE 1: When switching to DFT-s-OFDM waveform, as specified in the test configuration tables in clause 6.2.2.4.1, send an NR RRCReconfiguration message according to TS 38.508-1 [5] clause 4.6.3 Table 4.6.3-118 PUSCH-Config with TRANSFORM\_PRECODER\_ENABLED condition.

6.5.2.4.1.4.3 Message contents

Message contents are according to TS 38.508-1 [5] subclause 4.6 and 5.4 with the following exceptions:

Table 6.5.2.4.1.4.3-1: *P-Max* (Step 7)

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [5], Table 4.6.3-89 | | | |
| Information Element | Value/remark | Comment | Condition |
| P-Max | 23 |  | PC2 UE or PC1 UE |

Table 6.5.2.4.1.4.3-1a: Void

Table 6.5.2.4.1.4.3-2: *PUSCH-Config*

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [5] subclause 4.6.3 Table 4.6.3-118 PUSCH-Config | | | |
| Information Element | Value/remark | Comment | Condition |
| PUSCH-Config ::= SEQUENCE { |  |  |  |
| resourceAllocation | resourceAllocationType0 |  | Almost contiguous allocation |
|  | resourceAllocationType1 |  | Contiguous allocation |
| } |  |  |  |

Table 6.5.2.4.1.4.3-3: DMRS-UplinkConfig (Test ID 37 – 39 in Table 6.2.2.4.1-1)

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [5], Table 4.6.3-51 | | | |
| Information Element | Value/remark | Comment | Condition |
| DMRS-UplinkConfig ::= SEQUENCE { |  |  |  |
| transformPrecodingEnabled SEQUENCE { |  |  |  |
| dmrs-UplinkTransformPrecoding-r16 { |  |  |  |
| Setup SEQUENCE { |  |  |  |
| pi2BPSK-ScramblingID0 | Not present |  |  |
| pi2BPSK-ScramblingID1 | Not present |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |

Table 6.5.2.4.1.4.3-4: ServingCellConfig

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [5] Table 4.6.3-167 | | | |
| Information Element | Value/remark | Comment | Condition |
| ServingCellConfig ::= SEQUENCE { |  |  |  |
| uplinkConfig SEQUENCE { |  |  |  |
| powerBoostPi2BPSK | 1 |  | Test IDs where NOTE 3 in Table 6.2.2.4.1-1 applies. |
|  | 0 |  | Test IDs where NOTE 4 in Table 6.2.2.4.1-1 applies. |
| } |  |  |  |
| } |  |  |  |

6.5.2.4.1.5 Test requirement

The measured UE mean power in the channel bandwidth, derived in step 3, shall fulfil requirements in clause 6.2.2.5 as appropriate, and if the measured adjacent channel power is greater than –50 dBm then the measured NR ACLR, derived in step 6, shall be higher than the limits in Table 6.5.2.4.1.5-2.

The measured UE mean power in the channel bandwidth, derived in step 7, shall fulfil power class 3 requirements in Tables 6.2.2.5-1 and 6.2.2.5-3 as appropriate, and if the measured adjacent channel power is greater than –50 dBm then the measured NR ACLR, derived in step 7, shall be higher than the power class 3 limits in Table 6.5.2.4.1.5-2.

Table 6.5.2.4.1.5-1: NR ACLR measurement bandwidth

|  |  |  |  |
| --- | --- | --- | --- |
| Channel bandwidth | (MHz) | 5,10,15,20,25,30,35,40,45,50 | 60,70,80,90,100 |
| REF\_SCS | (kHz) | 15 | 30 |
| NR ACLR measurement bandwidth | (MHz) | MBW=REF\_SCS\*(12\*NRB+1)/1000 | |
| NOTE: “NRB” in the formula is the maximum transmission bandwidth configuration as defined in Table 5.3.2-1. | | | |

Table 6.5.2.4.1.5-2: NR ACLR requirement

|  |  |  |  |
| --- | --- | --- | --- |
|  | Power class 12 | Power class 2 | Power class 3 |
| NR ACLR | 37 - TT dB2 | 31 - TT dB | 30 - TT dB |
| NOTE 1: TT for each frequency and channel bandwidth is specified in Table 6.5.2.4.1.5-3.  NOTE 2: Applicable for power class 1 UE operating in Band n14. | | | |

Table 6.5.2.4.1.5-3: Test Tolerance (NR ACLR)

|  |  |  |  |
| --- | --- | --- | --- |
|  | f ≤ 3.0GHz | 3.0GHz < f ≤ 4.2GHz | 4.2GHz < f ≤ 6.0GHz |
| BW ≤ 100MHz | 0.8 dB | 0.8 dB | 0.8 dB |

##### 6.5.2.4.2 UTRA ACLR

6.5.2.4.2.1 Test purpose

To verify that UE transmitter does not cause unacceptable interference to adjacent channels in terms of Adjacent Channel Leakage power Ratio (ACLR).

6.5.2.4.2.2 Test applicability

This test case applies for network signalling values NS\_03U, NS\_05U, NS\_43U, and NS\_100 to all types of NR Power Class 3 UE release 15 and forward that don’t support Tx diversity.

6.5.2.4.2.3 Minimum conformance requirements

UTRA adjacent channel leakage power ratio (UTRAACLR) is the ratio of the filtered mean power centred on the assigned NR channel frequency to the filtered mean power centred on an adjacent(s) UTRA channel frequency.

UTRAACLR is specified for the first adjacent UTRA channel (UTRAACLR1) which centre frequency is ± 2.5 MHz from NR channel edge and for the 2nd adjacent UTRA channel (UTRAACLR2) which centre frequency is ± 7.5 MHz from NR channel edge.

The UTRA channel power is measured with an RRC filter with roll-off factor =0.22 and bandwidth of 3.84 MHz. The assigned NR channel power is measured with a rectangular filter with measurement bandwidth specified in Table 6.5.2.4.1.3-1.

If the measured adjacent channel power is greater than - 50dBm then the UTRAACLR1 and UTRAACLR2 shall be higher than the value specified in Table 6.5.2.4.2.3-1.

UTRAACLR is not applicable to the power class 3 UE operating in Band n12, n14, n17, and n30.

UTRAACLR is not applicable to the power class 1 UE operating in Band n14, n100 and n101.

Table 6.5.2.4.2.3-1: UTRA ACLR requirement

|  |  |
| --- | --- |
|  | Power class 3 |
| UTRAACLR1 | 33 dB |
| UTRAACLR2 | 36 dB |

UTRA ACLR requirement is applicable when signalled by the network with network signalling value indicated by the field *additionalSpectrumEmission*.

The normative reference for this requirement is TS 38.101-1 [2] clause 6.5.2.4.2.

6.5.2.4.2.4 Test description

6.5.2.4.2.4.1 Initial conditions

Same as in subclause 6.2.3.4.1 with the following exception;

- Only network signalling values NS\_03U, NS\_05U, NS\_43U, and NS\_100 with the corresponding band defined in Table 6.2.3.3.1-1 need to perform UTRA ACLR test.

- Message contents in step 6 are defined in clause 6.5.2.4.2.4.3.

6.5.2.4.2.4.2 Test procedure

1. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0\_1 for C\_RNTI to schedule the UL RMC according to the applicable test configuration table in clause 6.2.3.4.1. Since the UL has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC.

2. Send continuously power control “up” commands to the UE until the UE transmits at PUMAX level. Allow at least 200ms for the UE to reach PUMAX level.

3. Measure the mean power of the UE in the channel bandwidth of the radio access mode according to the test configuration, which shall meet the requirements described in 6.2.3.5 as appropriate. The period of the measurement shall be at least the continuous duration of one active sub-frame (1ms) and in the uplink symbols. For TDD slots with transient periods are not under test.

4. Measure the rectangular filtered mean power for the assigned NR channel using a rms detector. If the sweep count is higher than one, the trace mode shall be average.

5. Measure the RRC filtered mean power of the first and the second UTRA adjacent channel on both lower and upper side of the NR channel using a rms detector, respectively. If the sweep count is higher than one, the trace mode shall be average.

6. Calculate the ratios of the power between the values measured in step 4 over step 5 for lower and upper UTRA ACLR, respectively.

NOTE 1: When switching to DFT-s-OFDM waveform, as specified in the test configuration tables in 6.2.3.4.1 as appropriate, send an NR RRCReconfiguration message according to TS 38.508-1 [5] clause 4.6.3 Table 4.6.3-118 PUSCH-Config with TRANSFORM\_PRECODER\_ENABLED condition.

6.5.2.4.2.4.3 Message contents

Message contents are according to TS 38.508-1 [5] subclause 4.6 with the following exceptions:

Table 6.5.2.4.2.4.3-1: AdditionalSpectrumEmission

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: 38.508-1 [5] clause 4.6.3, Table 4.6.3-1 AdditionalSpectrumEmission | | | |
| Information Element | Value/remark | Comment | Condition |
| AdditionalSpectrumEmission | 3 (NS\_03U)  3 (NS\_05U)  3 (NS\_43U)  1 (NS\_100) | for band n2, n25, n66, n86  for band n1, n84  for band n8, n81  for band n1, n2, n3, n5, n8, n25, n66 (NOTE1) |  |
| NOTE 1: This NS can be signalled for NR bands that have UTRA services deployed | | | |

6.5.2.4.2.5 Test requirement

The measured UE mean power in the channel bandwidth, derived in step 3, shall fulfil requirements described in 6.2.3.5 as appropriate, and if the measured adjacent channel power is greater than –50 dBm then the measured UTRA ACLR, derived in step 6, shall be higher than the limits in table 6.5.2.4.2.5-2.

Table 6.5.2.4.2.5-1: Void

Table 6.5.2.4.2.5-2: UTRA ACLR requirement

|  |  |
| --- | --- |
|  | Power class 3 |
| UTRAACLR1 | 33 dB -TT |
| UTRAACLR2 | 36 dB - TT |
| NOTE 1: TT = 0.8 dB | |

### 6.5.3 Spurious emissions

Spurious emissions are emissions which are caused by unwanted transmitter effects such as harmonics emission, parasitic emissions, intermodulation products and frequency conversion products, but exclude out of band emissions unless otherwise stated. The spurious emission limits are specified in terms of general requirements in line with SM.329 [22] and NR operating band requirement to address UE co-existence.

To improve measurement accuracy, sensitivity and efficiency, the resolution bandwidth may be smaller than the measurement bandwidth. When the resolution bandwidth is smaller than the measurement bandwidth, the result should be integrated over the measurement bandwidth in order to obtain the equivalent noise bandwidth of the measurement bandwidth.

NOTE: For measurement conditions at the edge of each frequency range, the lowest frequency of the measurement position in each frequency range should be set at the lowest boundary of the frequency range plus MBW/2. The highest frequency of the measurement position in each frequency range should be set at the highest boundary of the frequency range minus MBW/2. MBW denotes the measurement bandwidth defined for the protected band.

#### 6.5.3.1 General spurious emissions

6.5.3.1.1 Test purpose

To verify that UE transmitter does not cause unacceptable interference to other channels or other systems in terms of transmitter spurious emissions.

6.5.3.1.2 Test applicability

This test case applies to all types of NR Power Class 1 release 15 and forward.

This test case applies to all types of NR Power Class 2 and Power Class 3 UE release 15 and forward that don’t support Tx diversity.

6.5.3.1.3 Minimum conformance requirements

Unless otherwise stated, the spurious emission limits apply for the frequency ranges that are more than FOOB (MHz) in Table 6.5.3.1.3-1 from the edge of the channel bandwidth. The spurious emission limits in Table 6.5.3.1.3-2 apply for all transmitter band configurations (NRB) and channel bandwidths.

Table 6.5.3.1.3-1: Boundary between NR out of band and general spurious emission domain

|  |  |
| --- | --- |
| Channel bandwidth | OOB boundary FOOB (MHz) |
| 3 | 6 |
| 5, 10, 15, 20, 25, 30, 35, 40, 45, 50, 60, 70, 80, 90, 100 | BWChannel + 5 |

Table 6.5.3.1.3-2: Requirement for general spurious emissions limits

|  |  |  |  |
| --- | --- | --- | --- |
| Frequency Range | Maximum Level | Measurement bandwidth | NOTE |
| 9 kHz ≤ f < 150 kHz | -36 dBm | 1 kHz |  |
| 150 kHz ≤ f < 30 MHz | -36 dBm | 10 kHz |  |
| 30 MHz ≤ f < 1000 MHz | -36 dBm | 100 kHz |  |
| 1 GHz ≤ f < 12.75 GHz | -30 dBm | 1 MHz | 4 |
| -25 dBm | 1 MHz | 3 |
| 12.75 GHz ≤ f < 5th harmonic of the upper frequency edge of the UL operating band in GHz | -30 dBm | 1 MHz | 1 |
| 12.75 GHz < f < 26 GHz | -30 dBm | 1 MHz | 2 |
| NOTE 1: Applies for Band for which the upper frequency edge of the UL Band is greater than 2.55 GHz and less than or equal to 5.2 GHz  NOTE 2: Applies for Band that the upper frequency edge of the UL Band more than 5.2 GHz  NOTE 3: Applies for Band n41, CA configurations including Band n41, and EN-DC configurations that include n41 specified in sub-clause 5.2B of [4] when NS\_04 is signalled.  NOTE 4: Does not apply for Band n41, CA configurations including Band n41, and EN-DC configurations that include n41 specified in subclause 5.2B of TS 38.101-3 [4] when NS\_04 is signalled. | | | |

The normative reference for this requirement is TS 38.101-1 [2] subclause 6.5.3.1

6.5.3.1.4 Test description

6.5.3.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, test channel bandwidths and sub-carrier spacing based on NR operating bands specified in Table 5.3.5-1. All of these configurations shall be tested with applicable test parameters for each combination of channel bandwidth and sub-carrier spacing, are shown in Table 6.5.3.1.4.1-1. The details of the uplink reference measurement channels (RMCs) are specified in Annexes A.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Table 6.5.3.1.4.1-1: Test Configuration Table

|  |  |  |  |
| --- | --- | --- | --- |
| Initial Conditions | | | |
| Test Environment as specified in TS 38.508-1 [5] subclause 4.1. | | Normal | |
| Test Frequencies as specified in TS 38.508-1 [5] subclause 4.3.1. | | Low range, Mid range, High range (NOTE 2) | |
| Test Channel Bandwidths as specified in TS 38.508-1 [5] subclause 4.3.1. | | Lowest, Mid, Highest | |
| Test SCS as specified in Table 5.3.5-1 | | Lowest | |
| Test Parameters | | | |
| Test ID | Downlink Configuration | Uplink Configuration | |
|  | N/A for Spurious Emissions testing | Modulation | RB allocation (NOTE 1) |
| 1 | CP-OFDM QPSK | OuterFull |
| 2 | CP-OFDM QPSK | Edge\_1RB\_Left |
| 3 | CP-OFDM QPSK | Edge\_1RB\_Right |
| NOTE 1: The specific configuration of each RB allocation is defined in Table 6.1-1 Common UL configuration.  NOTE 2: For NR band n28, 30MHz test channel bandwidth is tested with Low range and High range test frequencies. | | | |

1. Connect the SS to the UE antenna connectors as shown in TS 38.508-1 [5] Annex A, Figure A.3.1.1.1 for TE diagram and section A.3.2 for UE diagram.

2. The parameter settings for the cell are set up according to TS 38.508-1 [5] subclause 4.4.3.

3. Downlink signals are initially set up according to Annex C.0, C.1 and C.2, and uplink signals according to Annex G.0, G.1, G.2, G.3.0.

4. The UL Reference Measurement channels are set according to Table 6.5.3.1.4.1-1.

5. Propagation conditions are set according to Annex B.0.

6. Ensure the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On,* Test Mode *On* and Test Loop Function *On* according to TS 38.508-1 [5] clause 4.5. Message contents are defined in clause 6.5.3.1.4.3 with no exceptions.

6.5.3.1.4.2 Test procedure

1. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0\_1 for C\_RNTI to schedule the UL RMC according to Table 6.5.3.1.4.1-1. Since the UE has no payload data to send, the UE transmits uplink MAC padding bits on the UL RMC.

2. Send continuously uplink power control "up" commands in the uplink scheduling information to the UE until the UE transmits at PUMAX level.

3. Measure the power of the transmitted signal with a measurement filter of bandwidths according to Table 6.5.3.1.5-1. The centre frequency of the filter shall be stepped in contiguous steps according to Table 6.5.3.1.5-1. The measured power shall be verified for each step. The measurement period shall capture the active time slots. During measurement the spectrum analyser shall be set to 'Detector' = RMS. If the sweep count is higher than one, the trace mode shall be average.

4. For UE operating on Band n41, redo the test for frequency range 1 GHz ≤ f < 12.75 GHz with the message content in step 6 of initial conditions with exceptions defined in clause 6.5.3.1.4.3.

6.5.3.1.4.3 Message contents

Message contents are according to TS 38.508-1 [5] subclause 4.6.

Exception for step 4 in test procedure:

Table 6.5.3.1.4.3-1: Message contents

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [5], Table 4.6.3-1 | | | |
| Information Element | Value/remark | Comment | Condition |
| additionalSpectrumEmission | 1 (NS\_04) |  |  |

6.5.3.1.5 Test requirement

This clause specifies the requirements for the specified NR band for Transmitter Spurious emissions requirement with frequency range as indicated in Table 6.5.3.1.5-1.

Unless otherwise stated, the spurious emission limits apply for the frequency ranges that are more than FOOB (MHz) in Table 6.5.3.1.3-1 from the edge of the channel bandwidth. The spurious emission limits in Table 6.5.3.1.5-1 apply for all transmitter band configurations (NRB) and channel bandwidths.

The measured average power of spurious emission, derived in step 3, shall not exceed the described value in Table 6.5.3.1.5-1.

Table 6.5.3.1.5-1: General spurious emissions test requirements

|  |  |  |  |
| --- | --- | --- | --- |
| Frequency Range | Maximum Level | Measurement bandwidth | NOTE |
| 9 kHz ≤ f < 150 kHz | -36 dBm | 1 kHz |  |
| 150 kHz ≤ f < 30 MHz | -36 dBm | 10 kHz |  |
| 30 MHz ≤ f < 1000 MHz | -36 dBm | 100 kHz |  |
| 1 GHz ≤ f < 12.75 GHz | -30 dBm | 1 MHz | 4 |
| -25 dBm | 1 MHz | 3 |
| 12.75 GHz ≤ f < 5th harmonic of the upper frequency edge of the UL operating band in GHz | -30 dBm | 1 MHz | 1 |
| 12.75 GHz < f < 26 GHz | -30 dBm | 1 MHz | 2 |
| NOTE 1: Applies for Band for which the upper frequency edge of the UL Band is greater than 2.55 GHz and less than or equal to 5.2 GHz  NOTE 2: Applies for Band that the upper frequency edge of the UL Band more than 5.2 GHz  NOTE 3: Applies for Band n41, CA configurations including Band n41, and EN-DC configurations that include n41 specified in sub-clause 5.2B of 38.101-3 [4] when NS\_04 is signalled.  NOTE 4: Does not apply for Band n41, CA configurations including Band n41, and EN-DC configurations that include n41 specified in subclause 5.2B of TS 38.101-3 [4] when NS\_04 is signalled. | | | |

#### 6.5.3.2 Spurious emissions for UE co-existence

6.5.3.2.1 Test purpose

To verify that UE transmitter does not cause unacceptable interference to co-existing systems for the specified bands which has specific requirements in terms of transmitter spurious emissions.

6.5.3.2.2 Test applicability

This test case applies to all types of NR Power Class 1 release 15 and forward.

This test case applies to all types of NR Power Class 2 and Power Class 3 UE release 15 and forward that don’t support Tx diversity.

6.5.3.2.3 Minimum conformance requirements

This clause specifies the requirements for the specified NR band for coexistence with protected bands as indicated in Tables 6.5.3.2.3-1 to 6.5.3.2.3-4.r

NOTE: For measurement conditions at the edge of each frequency range, the lowest frequency of the measurement position in each frequency range should be set at the lowest boundary of the frequency range plus MBW/2. The highest frequency of the measurement position in each frequency range should be set at the highest boundary of the frequency range minus MBW/2. MBW denotes the measurement bandwidth defined for the protected band.

Table 6.5.3.2.3-1: Requirements for spurious emissions for UE co-existence Rel-15

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| NR Band | Spurious emission for UE co-existence | | | | | | |
| Protected band | Frequency range (MHz) | | | Maximum Level (dBm) | MBW (MHz) | NOTE |
| n1, n84 | E-UTRA Band 1, 5, 7, 8, 11, 18, 19, 20, 21, 22, 26, 27, 28, 31, 32, 38, 40, 41, 42, 43, 44, 45, 50, 51, 52, 65, 67, 68, 69, 72, 73, 74, 75, 76  NR Band n78, n79 | FDL\_low | -- | FDL\_high | -50 | 1 |  |
| NR Band n77 | FDL\_low | - | FDL\_high | -50 | 1 | 2 |
| E-UTRA Band 3, 34 | FDL\_low | - | FDL\_high | -50 | 1 | 15 |
| Frequency range | 1880 | - | 1895 | -40 | 1 | 15, 27 |
| Frequency range | 1895 | - | 1915 | -15.5 | 5 | 15, 26, 27 |
| Frequency range | 1915 | - | 1920 | +1.6 | 5 | 15, 26, 27 |
| n2 | E-UTRA Band 4, 5, 12, 13, 14, 17, 24, 26, 27, 28, 29, 30, 41, 42, 50, 51, 53, 66, 70, 71, 74, 85 | FDL\_low | - | FDL\_high | -50 | 1 |  |
| E-UTRA Band 2, 25 | FDL\_low | - | FDL\_high | -50 | 1 | 15 |
| E-UTRA Band 43 | FDL\_low | - | FDL\_high | -50 | 1 | 2 |
| n3, n80 | E-UTRA Band 1, 5, 7, 8, 20, 26, 27, 28, 31, 32, 33, 34, 38, 39, 40, 41, 43, 44, 45, 50, 51, 65, 67, 68, 69, 72, 73,74, 75, 76  NR Band n79 | FDL\_low | - | FDL\_high | -50 | 1 |  |
| E-UTRA Band 3 | FDL\_low | - | FDL\_high | -50 | 1 | 15 |
| E-UTRA Band 11, 18, 19, 21 | FDL\_low | - | FDL\_high | -50 | 1 |  |
| E-UTRA Band 22, 42, 52  NR Band n77, n78 | FDL\_low | - | FDL\_high | -50 | 1 | 2 |
| Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8 |
| n5 | E-UTRA Band 1, 2, 3, 4, 5, 7, 8, 12, 13, 14, 17, 18, 19, 24, 25, 26, 28, 29, 30, 31, 34, 38, 40, 42, 43, 45, 48, 50, 51, 65, 66, 70, 71, 73, 74, 85  NR Band n79 | FDL\_low | - | FDL\_high | -50 | 1 |  |
| E-UTRA Band 41, 52, 53  NR Band n77, n78 | FDL\_low | - | FDL\_high | -50 | 1 | 2 |
| E-UTRA Band 11, 21 | FDL\_low | - | FDL\_high | -50 | 1 |  |
| Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8 |
| n7 | E-UTRA Band 1, 2, 3, 4, 5, 7, 8, 12, 13, 14, 17, 20, 22, 26, 27, 28, 29, 30, 31, 32, 33, 34, 40, 42, 43, 50, 51, 52, 65, 66, 67, 68, 72, 74, 75, 76, 85,  NR Band n77, n78 | FDL\_low | - | FDL\_high | -50 | 1 |  |
| NR Band n79 | FDL\_low | - | FDL\_high | -50 | 1 | 2 |
| Frequency range | 2570 | - | 2575 | +1.6 | 5 | 15, 21, 26 |
| Frequency range | 2575 | - | 2595 | -15.5 | 5 | 15, 21, 26 |
| Frequency range | 2595 | - | 2620 | -40 | 1 | 15, 21 |
| n8, n81 | E-UTRA Band 1, 20, 28, 31, 32, 33, 34, 38, 39, 40, 45, 50, 51, 65, 67, 68, 69, 72, 73, 74, 75, 76 | FDL\_low | - | FDL\_high | -50 | 1 |  |
| E-UTRA band 3, 7, 22, 41, 42, 43, 52,  NR Band n77, n78, n79 | FDL\_low | - | FDL\_high | -50 | 1 | 2 |
| E-UTRA 8 | FDL\_low | - | FDL\_high | -50 | 1 | 15 |
| E-UTRA Band 11, 21 | FDL\_low | - | FDL\_high | -50 | 1 |  |
| Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8 |
| n12 | E-UTRA Band 2, 5, 13, 14, 17, 24, 25, 26, 27, 30, 41, 53, 70, 71, 74 | FDL\_low | - | FDL\_high | -50 | 1 |  |
| E-UTRA Band 4, 48, 51, 66 | FDL\_low | - | FDL\_high | -50 | 1 | 2 |
| E-UTRA Band 12, 85 | FDL\_low | - | FDL\_high | -50 | 1 | 15 |
| n20, n82 | E-UTRA Band 1, 3, 7, 8, 22, 31, 32, 33, 34, 40, 43, 50, 51, 65, 67, 68, 72, 74, 75, 76 | FDL\_low | - | FDL\_high | -50 | 1 |  |
| E-UTRA Band 20 | FDL\_low | - | FDL\_high | -50 | 1 | 15 |
| E-UTRA Band 38, 42, 52, 69  NR Band n77, n78 | FDL\_low | - | FDL\_high | -50 | 1 | 2 |
| Frequency range | 758 | - | 788 | -50 | 1 |  |
| n25 | E-UTRA Band 4, 5, 12, 13, 14, 17, 24, 26, 27, 28, 29, 30, 41, 42, 48, 53, 66, 70, 71, 85 | FDL\_low | - | FDL\_high | -50 | 1 |  |
| E-UTRA Band 2 | FDL\_low | - | FDL\_high | -50 | 1 | 15 |
| E-UTRA Band 25 | FDL\_low | - | FDL\_high | -50 | 1 | 15 |
| E-UTRA Band 43, 48 | FDL\_low | - | FDL\_high | -50 | 1 | 2 |
| n28, n83 | E-UTRA Band 1, 4, 22, 32, 42, 43, 50, 51, 65, 66, 74, 75, 76  NR Band n77, n78 | FDL\_low | - | FDL\_high | -50 | 1 | 2 |
| E-UTRA Band 1 | FDL\_low | - | FDL\_high | -50 | 1 | 19, 25 |
| E-UTRA Band 2, 3, 5, 7, 8, 18, 19, 20, 25, 26, 27, 31, 34, 38, 40, 41, 52, 72, 73  NR Band n79 | FDL\_low | - | FDL\_high | -50 | 1 |  |
| E-UTRA Band 11, 21 | FDL\_low | - | FDL\_high | -50 | 1 | 19, 24 |
| Frequency range | 470 | - | 694 | -42 | 8 | 15, 35 |
| Frequency range | 470 | - | 710 | -26.2 | 6 | 34 |
| Frequency range | 662 | - | 694 | -26.2 | 6 | 15 |
| Frequency range | 758 | - | 773 | -32 | 1 | 15 |
| Frequency range | 773 | - | 803 | -50 | 1 |  |
| Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8, 19 |
| n34 | E-UTRA Band 1, 3, 7, 8, 11, 18, 19, 20, 21, 22, 26, 28, 31, 32, 33, 38, 39, 40, 41, 42, 43, 44, 45, 50, 51, 52, 65, 67, 69, 72, 74, 75, 76  NR Band n78, n79 | FDL\_low | - | FDL\_high | -50 | 1 | 5 |
| NR Band n77 | FDL\_low | - | FDL\_high | -50 | 1 | 2 |
| Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8 |
| n38 | E-UTRA Band 1, 2, 3, 4, 5, 8, 12, 13, 14, 17, 20, 22, 27, 28, 29, 30, 31, 32, 33, 34, 40, 42, 43, 50, 51, 52, 65, 66, 67, 68, 72, 74, 75, 76, 85, | FDL\_low | - | FDL\_high | -50 | 1 |  |
| Frequency range | 2620 | - | 2645 | -15.5 | 5 | 15, 22, 26 |
| Frequency range | 2645 | - | 2690 | -40 | 1 | 15, 22 |
| n39 | E-UTRA Band 1, 8, 22, 26, 34, 40, 41, 42, 44, 45, 50, 51, 52, 74  NR Band n79 | FDL\_low | - | FDL\_high | -50 |  |  |
| NR Band n77, n78 | FDL\_low | - | FDL\_high | -50 | 1 | 2 |
| Frequency range | 1805 | - | 1855 | -40 | 1 | 33 |
| Frequency range | 1855 | - | 1880 | -15.5 | 5 | 15, 26, 33 |
| n40 | E-UTRA Band 1, 3, 5, 7, 8, 11, 18, 19, 20, 21, 22, 26, 27, 28, 31, 32, 33, 34, 38, 39, 41, 42, 43, 44, 45, 50, 51, 52, 65, 67, 68, 69, 72, 74, 75, 76  NR Band n77, n78 | FDL\_low | - | FDL\_high | -50 | 1 |  |
| NR Band n79 | FDL\_low | - | FDL\_high | -50 | 1 | 2 |
| Frequency range | 1884.5 |  | 1915.7 | -41 | 0.3 | 8 |
| n41 | E-UTRA Band 1, 2, 3, 4, 5, 8, 12, 13, 14, 17, 24, 25, 26, 27, 28, 29, 30, 34, 39, 42, 44, 45, 48, 50, 51, 52, 65, 66, 70, 71, 73, 74, 85,  NR Band n77, n78 | FDL\_low | - | FDL\_high | -50 | 1 |  |
| NR Band n79 | FDL\_low | - | FDL\_high | -50 | 1 | 2 |
| E-UTRA Band 11, 18, 19, 21 | FDL\_low | - | FDL\_high | -50 | 1 |  |
| Frequency range | 1884.5 |  | 1915.7 | -41 | 0.3 | 8 |
| n50 | E-UTRA Band 1, 2, 3, 4, 5, 7, 8, 12, 13, 17, 20, 26, 28, 29, 31, 34, 38, 39, 40, 41, 42, 43, 48, 52, 65, 66, 67, 68, 85 | FDL\_low | - | FDL\_high | -50 | 1 |  |
| n51 | E-UTRA Band 1, 2, 3, 4, 5, 7, 8, 12, 13, 17, 20, 26, 28, 29, 31, 34, 38, 39, 40, 41, 42, 43, 48, 65, 66, 67, 68 | FDL\_low | - | FDL\_high | -50 | 1 |  |
| n66, n86 | E-UTRA Band 2, 4, 5, 7, 12, 13, 14, 17, 25, 26, 27, 28, 29, 30, 38, 41, 43, 50, 51, 53, 66, 70, 71, 74, 85 | FDL\_low | - | FDL\_high | -50 | 1 |  |
| E-UTRA Band 42, 48 | FDL\_low | - | FDL\_high | -50 | 1 | 2 |
| n70 | E-UTRA Band 2, 4, 5, 12, 13, 14, 17, 24, 25, 26, 29, 30, 41, 48, 66, 70, 71, 85 | FDL\_low | - | FDL\_high | -50 | 1 | 2 |
| n71 | E-UTRA Band 4, 5, 12, 13, 14, 17, 24, 26, 30, 48, 53, 66, 85 | FDL\_low | - | FDL\_high | -50 | 1 |  |
| E-UTRA Band 2, 25, 41, 70 | FDL\_low | - | FDL\_high | -50 | 1 | 2 |
| E-UTRA Band 29 | FDL\_low | - | FDL\_high | -38 | 1 | 15 |
| E-UTRA Band 71 | FDL\_low | - | FDL\_high | -50 | 1 | 15 |
| n74 | E-UTRA Band 1, 2, 3, 4, 5, 7, 8, 12, 13, 17, 18, 19, 20, 26, 28, 29, 31, 34, 38, 39, 40, 41, 42, 43, 48, 52, 65, 66, 67, 68, 85  NR Band n77, n78 | FDL\_low | - | FDL\_high | -50 | 1 |  |
| NR Band n79 | FDL\_low | - | FDL\_high | -50 | 1 | 2 |
| Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8 |
| Frequency range | 1400 | - | 1427 | -32 | 27 | 15, 41 |
| Frequency range | 1475 | - | 1488 | -50 | 1 | 42 |
|  | Frequency range | 1475 | - | 1488 | -28 | 1 | 15, 42 |
|  | Frequency range | 1475 | - | 1488 | -50 | 1 | 15, 45 |
|  | Frequency range | 1475.9 | - | 1510.9 | -35 | 1 | 15, 46 |
| n77 | E-UTRA Band 1, 3, 5, 7, 8, 11, 18, 19, 20, 21, 26, 28, 34, 39, 40, 41, 65, 74 | FDL\_low | -- | FDL\_high | -50 | 1 |  |
| Frequency range | 1884.5 | -- | 1915.7 | -41 | 0.3 | 8 |
| n78 | E-UTRA Band 1, 3, 5, 7, 8, 11, 18, 19, 20, 21, 26, 28, 32, 34, 39, 40, 41, 65, 74, 75, 76 | FDL\_low | - | FDL\_high | -50 | 1 |  |
| Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8 |
| n79 | E-UTRA Band 1, 3, 5, 7, 8, 11, 18, 19, 21, 28, 34, 39, 40, 41, 42, 65, 74 | FDL\_low | -- | FDL\_high | -50 | 1 |  |
| Frequency range | 1884.5 | -- | 1915.7 | -41 | 0.3 |  |
| NOTE 1: FDL\_low and FDL\_high refer to each frequency band specified in Table 5.2-1 for NR band, Table 5.2-1 in TS 36.521-1 [21] for E-UTRA band.  NOTE 2: As exceptions, measurements with a level up to the applicable requirements defined in Table 6.5.3.1.3-2 are permitted for each assigned NR carrier used in the measurement due to 2nd, 3rd, 4th or 5th harmonic spurious emissions. Due to spreading of the harmonic emission the exception is also allowed for the first 1 MHz frequency range immediately outside the harmonic emission on both sides of the harmonic emission. This results in an overall exception interval centred at the harmonic emission of (2MHz + N x LCRB x RBSizekHz), where N is 2, 3, 4, [5] for the 2nd, 3rd, 4th [or 5th] harmonic respectively. The exception is allowed if the measurement bandwidth (MBW) totally or partially overlaps the overall exception interval.  NOTE 3: 15 kHz SCS is assumed when RB is mentioned in the note when channel bandwidth is less than or equal to 50MHz, lowest SCS is assumed when channel bandwidth is larger than 50MHz. The transmission bandwidth in terms of RB position and range is not limited to 15 kHz SCS and shall scale with SCS accordingly.  NOTE 4: Void  NOTE 5: For non synchronised TDD operation to meet these requirements some restriction will be needed for either the operating band or protected band.  NOTE 6: N/A  NOTE 7: Void.  NOTE 8: Applicable when co-existence with PHS system operating in 1884.5 -1915.7MHz.  NOTE 9: Void  NOTE 10: Void  NOTE 11: Void  NOTE 12: Void  NOTE 13: Void.  NOTE 14: Void  NOTE 15: These requirements also apply for the frequency ranges that are less than FOOB (MHz) in Table 6.5.3.1.3-1 from the edge of the channel bandwidth.  NOTE 16: Void  NOTE 17: Void  NOTE 18: Void  NOTE 19: Applicable when the assigned NR carrier is confined within 718 MHz and 748 MHz and when the channel bandwidth used is 5 or 10 MHz.  NOTE 20: Void  NOTE 21: This requirement is applicable for any channel bandwidths within the range 2500 - 2570 MHz with the following restriction: for carriers of 15 MHz bandwidth when carrier centre frequency is within the range 2560.5 - 2562.5 MHz and for carriers of 20 MHz bandwidth when carrier centre frequency is within the range 2552 - 2560 MHz the requirement is applicable only for an uplink transmission bandwidth less than or equal to 54 RB.  NOTE 22: This requirement is applicable for power class 3 UE for any channel bandwidths within the range 2570 - 2615 MHz with the following restriction: for carriers of 15 MHz bandwidth when carrier centre frequency is within the range 2605.5 - 2607.5 MHz and for carriers of 20 MHz bandwidth when carrier centre frequency is within the range 2597 - 2605 MHz the requirement is applicable only for an uplink transmission bandwidth less than or equal to 54 RB. For power class 2 UE for any channel bandwidths within the range 2570 - 2615 MHz, NS\_44 shall apply. For power class 2 or 3 UE for carriers with channel bandwidth overlapping the frequency range 2615 - 2620 MHz the requirement applies with the maximum output power configured to +19 dBm in the IE P-Max.  NOTE 23: Void.  NOTE 24: As exceptions, measurements with a level up to the applicable requirement of -38 dBm/MHz is permitted for each assigned NR carrier used in the measurement due to 2nd harmonic spurious emissions. An exception is allowed if there is at least one individual RB within the transmission bandwidth (see Figure 5.3.1-1) for which the 2nd harmonic totally or partially overlaps the measurement bandwidth (MBW).  NOTE 25: As exceptions, measurements with a level up to the applicable requirement of -36 dBm/MHz is permitted for each assigned NR carrier used in the measurement due to 3rd harmonic spurious emissions. An exception is allowed if there is at least one individual RB within the transmission bandwidth (see Figure 5.3.1-1) for which the 3rd harmonic totally or partially overlaps the measurement bandwidth (MBW).  NOTE 26: For these adjacent bands, the emission limit could imply risk of harmful interference to UE(s) operating in the protected operating band.  NOTE 27: This requirement is applicable for any channel bandwidths within the range 1920 - 1980 MHz with the following restriction: for carriers of 15 MHz bandwidth when carrier centre frequency is within the range 1927.5 - 1929.5 MHz and for carriers of 20 MHz bandwidth when carrier centre frequency is within the range 1930 - 1938 MHz the requirement is applicable only for an uplink transmission bandwidth less than or equal to 54 RB.  NOTE 28: Void  NOTE 29: Void  NOTE 30: Void  NOTE 31: Void  NOTE 32: Void  NOTE 33: This requirement is only applicable for carriers with bandwidth up to 20MHz and confined within 1885-1920 MHz (requirement for carriers with at least 1RB confined within 1880 - 1885 MHz is not specified). This requirement applies for an uplink transmission bandwidth less than or equal to 54 RB for carriers of 15 MHz bandwidth when carrier centre frequency is within the range 1892.5 - 1894.5 MHz and for carriers of 20 MHz bandwidth when carrier centre frequency is within the range 1895 - 1903 MHz.  NOTE 34: This requirement is applicable for 5 and 10 MHz NR channel bandwidth allocated within 718-728MHz. For carriers of 10 MHz bandwidth, this requirement applies for an uplink transmission bandwidth less than or equal to 30 RB with RBstart > 1 and RBstart < 48.  NOTE 35: This requirement is applicable in the case of a 10 MHz NR carrier confined within 703 MHz and 733 MHz, otherwise the requirement of -25 dBm with a measurement bandwidth of 8 MHz applies.  NOTE 36: Void  NOTE 37: Void  NOTE 38: Void  NOTE 39: Void.  NOTE 40: Void  NOTE 41: Applicable for cases when the lower edge of the assigned NR UL channel bandwidth frequency is greater than or equal to 1427 MHz + the channel BW assigned for 5 and 10 MHz bandwidth, and when the lower edge of the assigned NR UL channel bandwidth frequency is greater than or equal to 1440 MHz for 15 and 20 MHz bandwidth. This requirement shall be verified with UE transmission power of 15 dBm.  NOTE 42: Applicable when upper edge of the assigned NR UL channel bandwidth frequency is more than 1460MHz and more than 1460MHz and less than or equal to 1470MHz for 5 MHz bandwidth, and when the upper edge of the assigned NR UL channel bandwidth frequency is less than or equal to 1465 MHz for10 MHz bandwidth.  NOTE 43: Void  NOTE 44: Void  NOTE 45: Applicable when upper edge of the assigned NR UL channel bandwidth frequency is equal to or less than 1460MHz.  NOTE 46: Applicable for 5MHz bandwidth and when the NR carrier is within 1447.9 – 1462.9 MHz. | | | | | | | |

NOTE: To simplify Table 6.5.3.2.3-1, E-UTRA band numbers are listed for bands which are specified only for E-UTRA operation or both E-UTRA and NR operation. NR band numbers are listed for bands which are specified only for NR operation.

Table 6.5.3.2.3-2 Requirements for spurious emissions for UE co-existence Rel-16 specifies the requirements for NR bands for coexistence with protected bands.

Table 6.5.3.2.3-2: Requirements for spurious emissions for UE co-existence Rel-16

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| NR Band | Spurious emission for UE co-existence | | | | | | |
| Protected band | Frequency range (MHz) | | | Maximum Level (dBm) | MBW (MHz) | NOTE |
| n1, n84 | E-UTRA Band 1, 5, 7, 8, 11, 18, 19, 20, 21, 22, 26, 27, 28, 31, 32, 38, 40, 41, 42, 43, 44, 45, 50, 51, 52, 65, 67, 68, 69, 72, 73, 74, 75, 76  NR Band n78, n79 | FDL\_low | -- | FDL\_high | -50 | 1 |  |
| NR Band n77 | FDL\_low | - | FDL\_high | -50 | 1 | 2 |
| E-UTRA Band 3 | FDL\_low | - | FDL\_high | -50 | 1 | 15 |
| E-UTRA Band 34 | FDL\_low | - | FDL\_high | -50 | 1 | 15, 43 |
| Frequency range | 1880 | - | 1895 | -40 | 1 | 15, 27 |
| Frequency range | 1895 | - | 1915 | -15.5 | 5 | 15, 26, 27 |
| Frequency range | 1915 | - | 1920 | +1.6 | 5 | 15, 26, 27 |
| n2 | E-UTRA Band 4, 5, 12, 13, 14, 17, 24, 26, 27, 28, 29, 30, 41, 42, 50, 51, 53, 66, 70, 71, 74, 85 | FDL\_low | - | FDL\_high | -50 | 1 |  |
| E-UTRA Band 2, 25 | FDL\_low | - | FDL\_high | -50 | 1 | 15 |
| E-UTRA Band 43, 48  NR Band n77 | FDL\_low | - | FDL\_high | -50 | 1 | 2 |
| n3, n80 | E-UTRA Band 1, 5, 7, 8, 20, 26, 27, 28, 31, 32, 33, 34, 38, 39, 40, 41, 43, 44, 45, 50, 51, 65, 67, 68, 69, 72, 73,74, 75, 76.  NR Band n79 | FDL\_low | - | FDL\_high | -50 | 1 |  |
| E-UTRA Band 3 | FDL\_low | - | FDL\_high | -50 | 1 | 15 |
| E-UTRA Band 11, 18, 19, 21 | FDL\_low | - | FDL\_high | -50 | 1 |  |
| E-UTRA Band 22, 42,52  NR Band n77, n78 | FDL\_low | - | FDL\_high | -50 | 1 | 2 |
| Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8 |
| n5, n89 | E-UTRA Band 1, 2, 3, 4, 5, 7, 8, 12, 13, 14, 17, 18, 19, 24, 25, 26, 28, 29, 30, 31, 34, 38, 40, 42, 43, 45, 48, 50, 51, 65, 66, 70, 71, 73, 74, 85  NR Band n79 | FDL\_low | - | FDL\_high | -50 | 1 |  |
| E-UTRA Band 41, 52, 53  NR Band n77, n78 | FDL\_low | - | FDL\_high | -50 | 1 | 2 |
| E-UTRA Band 11, 21 | FDL\_low | - | FDL\_high | -50 | 1 |  |
| Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8 |
| n7 | E-UTRA Band 1, 2, 3, 4, 5, 7, 8, 12, 13, 14, 17, 20, 22, 26, 27, 28, 29, 30, 31, 32, 33, 34, 40, 42, 43, 50, 51, 52, 65, 66, 67, 68, 72, 74, 75, 76, 85  NR Band n77, n78 | FDL\_low | - | FDL\_high | -50 | 1 |  |
| NR Band n79 | FDL\_low | - | FDL\_high | -50 | 1 | 2 |
| Frequency range | 2570 | - | 2575 | +1.6 | 5 | 15, 21, 26 |
| Frequency range | 2575 | - | 2595 | -15.5 | 5 | 15, 21, 26 |
| Frequency range | 2595 | - | 2620 | -40 | 1 | 15, 21 |
| n8, n81, n93, n94 | E-UTRA Band 1, 20, 28, 31, 32, 33, 34, 38, 39, 40, 45, 50, 51, 65, 67, 68, 69, 72, 73, 74, 75, 76 | FDL\_low | - | FDL\_high | -50 | 1 |  |
| E-UTRA band 3, 7, 22, 41, 42, 43, 52  NR Band n77, n78, n79 | FDL\_low | - | FDL\_high | -50 | 1 | 2 |
| E-UTRA 8 | FDL\_low | - | FDL\_high | -50 | 1 | 15 |
| E-UTRA Band 11, 21 | FDL\_low | - | FDL\_high | -50 | 1 |  |
| Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8 |
| n12 | E-UTRA Band 2, 5, 13, 14, 17, 24, 25, 26, 27, 30, 41, 53, 70, 71, 74 | FDL\_low | - | FDL\_high | -50 | 1 |  |
| E-UTRA Band 4, 48, 50, 51, 66  NR Band n77 | FDL\_low | - | FDL\_high | -50 | 1 | 2 |
| E-UTRA Band 12, 85 | FDL\_low | - | FDL\_high | -50 | 1 | 15 |
| n14 | E-UTRA Band 2, 4, 5, 12, 13, 14, 17, 23, 24, 25, 26, 27, 29, 30, 41, 48, 53, 66, 70, 71, 85 | FDL\_low | - | FDL\_high | -50 | 1 |  |
| NR Band n77 | FDL\_low | - | FDL\_high | -50 | 1 | 2 |
| Frequency range | 769 | - | 775 | -35 | 0.00625 | 12, 15 |
| Frequency range | 799 | - | 805 | -35 | 0.00625 | 11, 12, 15 |
| n18 | E-UTRA Band 1, 3, 11, 21, 34, 40, 42, 65  NR Band n79 | FDL\_low | - | FDL\_high | -50 | 1 |  |
| NR Band n77, n78 | FDL\_low | - | FDL\_high | -50 | 1 | 2 |
| Frequency range | 758 | - | 799 | -50 | 1 |  |
| Frequency range | 799 | - | 803 | -40 | 1 |  |
| Frequency range | 860 | - | 890 | -40 | 1 |  |
| Frequency range | 945 | - | 960 | -50 | 1 |  |
| Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8 |
| Frequency range | 2545 | - | 2575 | -50 | 1 |  |
| Frequency range | 2595 | - | 2645 | -50 | 1 |  |
| n20, n82, n91, n92 | E-UTRA Band 1, 3, 7, 8, 22, 31, 32, 33, 34, 40, 43, 50, 51, 65, 67, 68, 72, 74, 75, 76 | FDL\_low | - | FDL\_high | -50 | 1 |  |
| E-UTRA Band 20 | FDL\_low | - | FDL\_high | -50 | 1 | 15 |
| E-UTRA Band 38, 42, 52, 69  NR Band n77, n78 | FDL\_low | - | FDL\_high | -50 | 1 | 2 |
| Frequency range | 758 | - | 788 | -50 | 1 |  |
| n25 | E-UTRA Band 4, 5, 12, 13, 14, 17, 24, 26, 27, 28, 29, 30, 41, 42, 53, 66, 70, 71, 85 | FDL\_low | - | FDL\_high | -50 | 1 |  |
| E-UTRA Band 2 | FDL\_low | - | FDL\_high | -50 | 1 | 15 |
| E-UTRA Band 25 | FDL\_low | - | FDL\_high | -50 | 1 | 15 |
| E-UTRA Band 43, 48  NR Band n77 | FDL\_low | - | FDL\_high | -50 | 1 | 2 |
| n26 | E-UTRA Band 1, 2, 3, 4, 5, 11, 12, 13, 14, 17, 18,19, 21, 24, 25, 26, 29, 30, 31, 34, 39, 40, 42, 43, 48, 50, 51, 65, 66, 70, 71, 73,74, 85 | FDL\_low | - | FDL\_high | -50 | 1 |  |
| E-UTRA Band 41, 53  NR Band n77, n78, n79 | FDL\_low | - | FDL\_high | -50 | 1 | 2 |
| Frequency range | 703 | - | 799 | -50 | 1 |  |
| Frequency range | 799 | - | 803 | -40 | 1 | 15 |
| Frequency range | 945 | - | 960 | -50 | 1 |  |
| Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8 |
| n28, n83 | E-UTRA Band 1, 4, 22, 32, 42, 43, 50, 51, 65, 66, 74, 75, 76  NR Band n77, n78 | FDL\_low | - | FDL\_high | -50 | 1 | 2 |
| E-UTRA Band 1 | FDL\_low | - | FDL\_high | -50 | 1 | 19, 25 |
| E-UTRA Band 2, 3, 5, 7, 8, 18, 19, 20, 25, 26, 27, 31, 34, 38, 39, 40, 41, 52, 72, 73  NR Band n79 | FDL\_low | - | FDL\_high | -50 | 1 |  |
| E-UTRA Band 11, 21 | FDL\_low | - | FDL\_high | -50 | 1 | 19, 24 |
| Frequency range | 470 | - | 694 | -42 | 8 | 15, 35 |
| Frequency range | 470 | - | 710 | -26.2 | 6 | 34 |
| Frequency range | 662 | - | 694 | -26.2 | 6 | 15 |
| Frequency range | 758 | - | 773 | -32 | 1 | 15 |
| Frequency range | 773 | - | 803 | -50 | 1 |  |
| Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8, 19 |
| n30 | E-UTRA Band 2, 4, 5, 7, 12, 13, 14, 17, 24, 25, 26, 27, 29, 30, 38, 41, 48, 53, 66, 70, 71, 85  NR Band n77 | FDL\_low | - | FDL\_high | -50 | 1 |  |
| n34 | E-UTRA Band 1, 3, 7, 8, 11, 18, 19, 20, 21, 22, 26, 28, 31, 32, 33, 38,39, 40, 41, 42, 43, 44, 45, 50, 51, 52, 65, 67, 69, 72, 74, 75, 76  NR Band n78, n79 | FDL\_low | - | FDL\_high | -50 | 1 | 5 |
| NR Band n77 | FDL\_low | - | FDL\_high | -50 | 1 | 2 |
| Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8 |
| n38 | E-UTRA Band 1, 2, 3, 4, 5, 8, 12, 13, 14, 17, 20, 22, 27, 28, 29, 30, 31, 32, 33, 34, 40, 42, 43, 50, 51, 52, 65, 66, 67, 68, 72, 74, 75, 76, 85 | FDL\_low | - | FDL\_high | -50 | 1 |  |
| NR Band n77, n78, n79 | FDL\_low | - | FDL\_high | -50 | 1 |  |
| Frequency range | 2620 | - | 2645 | -15.5 | 5 | 15, 22, 26 |
| Frequency range | 2645 | - | 2690 | -40 | 1 | 15, 22 |
| n39 | E-UTRA Band 1, 8, 22, 26, 28, 34, 40, 41, 42, 44, 45, 50, 51, 52, 74  NR Band n79 | FDL\_low | - | FDL\_high | -50 | 1 |  |
| NR Band n77, n78 | FDL\_low | - | FDL\_high | -50 | 1 | 2 |
| Frequency range | 1805 | - | 1855 | -40 | 1 | 33 |
| Frequency range | 1855 | - | 1880 | -15.5 | 5 | 15, 26, 33 |
| n40 | E-UTRA Band 1, 3, 5, 7, 8, 11, 18, 19, 20, 21, 22, 26, 27, 28, 31, 32, 33, 34, 38, 39, 41, 42, 43, 44, 45, 50, 51, 52, 65, 67, 68, 69, 72, 74, 75, 76  NR Band n77, n78 | FDL\_low | - | FDL\_high | -50 | 1 | 44 |
| NR Band n79 | FDL\_low | - | FDL\_high | -50 | 1 | 2 |
| Frequency range | 1884.5 |  | 1915.7 | -41 | 0.3 | 8 |
| n41 | E-UTRA Band 1, 2, 3, 4, 5, 8, 12, 13, 14, 17, 24, 25, 26, 27, 28, 29, 30, 34, 39, 42, 44, 45, 48, 50, 51, 52, 65, 66, 70, 71, 73, 74, 85  NR Band n77, n78 | FDL\_low | - | FDL\_high | -50 | 1 |  |
| E-UTRA Band 40 | FDL\_low | - | FDL\_high | -40 | 1 |  |
| NR Band n79 | FDL\_low | - | FDL\_high | -50 | 1 | 2 |
| E-UTRA Band 11, 18, 19, 21 | FDL\_low | - | FDL\_high | -50 | 1 |  |
| Frequency range | 1884.5 |  | 1915.7 | -41 | 0.3 | 8 |
| n47 | E-UTRA Band 1, 3, 5, 7, 8, 22, 26, 28, 34, 39, 40, 41, 42, 44, 45, 65, 68, 72, 73 | FDL\_low | - | FDL\_high | -50 | 1 |  |
| NR Band n71, n77, n78, n79 | FDL\_low | - | FDL\_high | -50 | 1 |  |
| n48 | E-UTRA Band 2, 4, 5, 12, 13, 14, 17, 24, 25, 26, 29, 30, 41, 50, 51, 66, 70, 71, 74, 85 | FDL\_low | - | FDL\_high | -50 | 1 |  |
| n50 | E-UTRA Band 1, 2, 3, 4, 5, 7, 8, 12, 13, 17, 20, 26, 28, 29, 31, 34, 38, 39, 40, 41, 42, 43, 48, 65, 66, 67, 68 | FDL\_low | - | FDL\_high | -50 | 1 |  |
| n51 | E-UTRA Band 1, 2, 3, 4, 5, 7, 8, 12, 13, 17, 20, 26, 28, 29, 31, 34, 38, 39, 40, 41, 42, 43, 48, 52, 65, 66, 67, 68, 85 | FDL\_low | - | FDL\_high | -50 | 1 |  |
| n53 | E-UTRA Band 2, 4, 5, 12, 13, 14, 17, 24, 25, 26, 29, 30, 48, 66, 70, 71, 85  NR Band n77 | FDL\_low | - | FDL\_high | -50 | 1 |  |
| n65 | E-UTRA Band 1, 3, 5, 7, 8, 11, 18, 19, 20, 21, 22, 26, 27, 28, 31, 32, 38, 40, 41, 42, 43, 50, 51, 65, 68, 69, 72, 74, 75, 76  NR Band n78, n79 | FDL\_low | - | FDL\_high | -50 | 1 |  |
| NR Band n77 | FDL\_low | - | FDL\_high | -50 | 1 | 2 |
| E-UTRA Band 34 | FDL\_low | - | FDL\_high | -50 | 1 | 43 |
| Frequency range | 1900 | - | 1915 | -15.5 | 5 | 15, 26, 27 |
| Frequency range | 1915 | - | 1920 | +1.6 | 5 | 15, 26, 27 |
| n66, n86 | E-UTRA Band 2, 4, 5, 7, 12, 13, 14, 17, 25, 26, 27, 28, 29, 30, 38, 41, 43, 50, 51, 53, 66, 70, 71, 74, 85 | FDL\_low | - | FDL\_high | -50 | 1 |  |
| E-UTRA Band 42, 48  NR Band n77 | FDL\_low | - | FDL\_high | -50 | 1 | 2 |
| n70 | E-UTRA Band 2, 4, 5, 12, 13, 14, 17, 24, 25, 26, 29, 30, 41, 48, 66, 70, 71, 85 | FDL\_low | - | FDL\_high | -50 | 1 |  |
| NR Band n47, n77 | FDL\_low | - | FDL\_high | -50 | 1 | 2 |
| n71 | E-UTRA Band 4, 5, 12, 13, 14, 17, 24, 26, 30, 48, 53, 66, 85 | FDL\_low | - | FDL\_high | -50 | 1 |  |
| E-UTRA Band 2, 25, 41, 70  NR Band n77 | FDL\_low | - | FDL\_high | -50 | 1 | 2 |
| E-UTRA Band 29 | FDL\_low | - | FDL\_high | -38 | 1 | 15 |
| E-UTRA Band 71 | FDL\_low | - | FDL\_high | -50 | 1 | 15 |
| n74 | E-UTRA Band 1, 2, 3, 4, 5, 7, 8, 12, 13, 17, 18, 19, 20, 26, 28, 29, 31, 34, 38, 39, 40, 41, 42, 43, 48, 52, 65, 66, 67, 68, 85  NR Band n77, n78 | FDL\_low | - | FDL\_high | -50 | 1 |  |
| NR Band n79 | FDL\_low | - | FDL\_high | -50 | 1 | 2 |
| Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8 |
| Frequency range | 1400 | - | 1427 | -32 | 27 | 15, 41 |
| Frequency range | 1475 | - | 1488 | -28 | 1 | 15, 42 |
| Frequency range | 1475 | - | 1488 | -50 | 1 | 15, 45 |
| Frequency range | 1475.9 | - | 1510.9 | -35 | 1 | 15, 46 |
| Frequency range | 1488 | - | 1518 | -50 | 1 | 15 |
| n77 | E-UTRA Band 1, 2, 3, 4, 5, 7, 8, 11, 12, 13, 14, 17, 18, 19, 20, 21, 24, 25, 26, 27, 28, 29, 30, 34, 39, 40, 41, 53, 65, 66, 70, 71, 74, 85 | FDL\_low | - | FDL\_high | -50 | 1 |  |
| Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8 |
| n78 | E-UTRA Band 1, 3, 5, 7, 8, 11, 18, 19, 20, 21, 26, 28, 32, 34, 39, 40, 41, 65, 75, 76 | FDL\_low | - | FDL\_high | -50 | 1 |  |
| Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8 |
| n79 | E-UTRA Band 1, 3, 5, 7, 8, 11, 18, 19, 21, 28, 34, 39, 40, 41, 42, 65, 74 | FDL\_low | - | FDL\_high | -50 | 1 |  |
| Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8 |
| n95 | E-UTRA Band 1, 3, 5, 8, 28, 39, 40, 41  NR Band n78, n79 | FDL\_low | - | FDL\_high | -50 | 1 | 5 |
| NR Band n77 | FDL\_low | - | FDL\_high | -50 | 1 | 2 |
| Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8 |
| NOTE 1: FDL\_low and FDL\_high refer to each frequency band specified in Table 5.2-1 in TS 38.101-1 or Table 5.5-1 in TS 36.101.  NOTE 2: As exceptions, measurements with a level up to the applicable requirements defined in Table 6.5.3.1-2 are permitted for each assigned NR carrier used in the measurement due to 2nd, 3rd, 4th or 5th harmonic spurious emissions. Due to spreading of the harmonic emission the exception is also allowed for the first 1 MHz frequency range immediately outside the harmonic emission on both sides of the harmonic emission. This results in an overall exception interval centred at the harmonic emission of (2 MHz + N x LCRB x RBSize kHz), where N is 2, 3, 4, 5 for the 2nd, 3rd, 4th or 5th harmonic respectively. The exception is allowed if the measurement bandwidth (MBW) totally or partially overlaps the overall exception interval.  NOTE 3: 15 kHz SCS is assumed when RB is mentioned in the note when channel bandwidth is less than or equal to 50 MHz, lowest SCS is assumed when channel bandwidth is larger than 50 MHz. The transmission bandwidth in terms of RB position and range is not limited to 15 kHz SCS and shall scale with SCS accordingly.  NOTE 4: Void  NOTE 5: For non-synchronised TDD operation to meet these requirements some restriction will be needed for either the operating band or protected band.  NOTE 6: N/A  NOTE 7: Void.  NOTE 8: Applicable when co-existence with PHS system operating in 1884.5 -1915.7 MHz.  NOTE 9: Void  NOTE 10: Void  NOTE 11: Void  NOTE 12: The emissions measurement shall be sufficiently power averaged to ensure a standard deviation < 0.5 dB  NOTE 13: Void.  NOTE 14: Void  NOTE 15: These requirements also apply for the frequency ranges that are less than FOOB (MHz) in Table 6.5.3.1.3-1 from the edge of the channel bandwidth.  NOTE 16: Void  NOTE 17: Void  NOTE 18: Void  NOTE 19: Applicable when the assigned NR carrier is confined within 718 MHz and 748 MHz and when the channel bandwidth used is 5 or 10 MHz.  NOTE 20: Void  NOTE 21: This requirement is applicable for any channel bandwidths up to 20 MHz within the range 2500 - 2570 MHz with the following restriction: for carriers of 15 MHz bandwidth when carrier centre frequency is within the range 2560.5 - 2562.5 MHz and for carriers of 20 MHz bandwidth when carrier centre frequency is within the range 2552 - 2560 MHz the requirement is applicable only for an uplink transmission bandwidth less than or equal to 54 RB.  NOTE 22: This requirement is applicable for power class 3 UE for any channel bandwidths up to 20 MHz. For channel bandwidth within the range 2570 - 2615 MHz with the following restriction: for carriers of 15 MHz bandwidth when the carrier centre frequency is within the range 2605.5 - 2607.5 MHz and for carriers of 20 MHz bandwidth when the carrier centre frequency is within the range 2597 - 2605 MHz the requirement is applicable only for an uplink transmission bandwidth less than or equal to 54 RB. For carriers overlapping the frequency range 2615 - 2620 MHz the requirement applies with the maximum output power configured to +19 dBm in the IE P-Max.  NOTE 23: Void.  NOTE 24: As exceptions, measurements with a level up to the applicable requirement of -38 dBm/MHz is permitted for each assigned NR carrier used in the measurement due to 2nd harmonic spurious emissions. An exception is allowed if there is at least one individual RB within the transmission bandwidth (see Figure 5.3.1-1) for which the 2nd harmonic totally or partially overlaps the measurement bandwidth (MBW).  NOTE 25: As exceptions, measurements with a level up to the applicable requirement of -36 dBm/MHz is permitted for each assigned NR carrier used in the measurement due to 3rd harmonic spurious emissions. An exception is allowed if there is at least one individual RB within the transmission bandwidth (see Figure 5.3.1-1) for which the 3rd harmonic totally or partially overlaps the measurement bandwidth (MBW).  NOTE 26: For these adjacent bands, the emission limit could imply risk of harmful interference to UE(s) operating in the protected operating band.  NOTE 27: This requirement is applicable for channel bandwidths up to 20 MHz within the range 1920 - 1980 MHz with the following restriction: for carriers of 15 MHz bandwidth when the carrier centre frequency is within the range 1927.5 - 1929.5 MHz and for carriers of 20 MHz bandwidth when the carrier centre frequency is within the range 1930 - 1938 MHz the requirement is applicable only for an uplink transmission bandwidth less than or equal to 54 RB.  NOTE 28: Void  NOTE 29: Void  NOTE 30: Void  NOTE 31: Void  NOTE 32: Void  NOTE 33: This requirement is only applicable for carriers with bandwidth up to 20MHz and confined within 1885-1920 MHz (requirement for carriers with at least 1RB confined within 1880 - 1885 MHz is not specified). This requirement applies for an uplink transmission bandwidth less than or equal to 54 RB for carriers of 15 MHz bandwidth when carrier centre frequency is within the range 1892.5 - 1894.5 MHz and for carriers of 20 MHz bandwidth when carrier centre frequency is within the range 1895 - 1903 MHz.  NOTE 34: This requirement is applicable for 5 and 10 MHz NR channel bandwidth allocated within 718-728 MHz. For carriers of 10 MHz bandwidth, this requirement applies for an uplink transmission bandwidth less than or equal to 30 RB with RBstart > 1 and RBstart < 48.  NOTE 35: This requirement is applicable in the case of a 10 MHz NR carrier confined within 703 MHz and 733 MHz, otherwise the requirement of -25 dBm with a measurement bandwidth of 8 MHz applies.  NOTE 36: Void  NOTE 37: Void  NOTE 38: Void  NOTE 39: Void.  NOTE 40: Void  NOTE 41: Applicable for cases and when the lower edge of the assigned NR UL channel bandwidth frequency is greater than or equal to 1427 MHz + the channel BW assigned for 5 and 10 MHz bandwidth, and when the lower edge of the assigned NR UL channel bandwidth frequency is greater than or equal to 1440 MHz for 15 and 20 MHz bandwidth. This requirement shall be verified with UE transmission power configured as high as possible but no higher than 15 dBm.  NOTE 42: Applicable when upper edge of the assigned NR UL channel bandwidth frequency is more than 1460 MHz and less than or equal to 1470 MHz for 5 MHz bandwidth, and when the upper edge of the assigned NR UL channel bandwidth frequency is more than 1460 MHz and less than or equal to 1465 MHz for 10 MHz bandwidth.  NOTE 43: This requirement is applicable for UE which is operating in power class 3 and NR channel bandwidths up to 20 MHz within frequency range 1920-1980 MHz.  NOTE 44: As exceptions, for 90 and 100 MHz channel bandwidth, -40 dBm/MHz is applicable in the frequency range of 2496 – 2505 MHz  NOTE 45: Applicable when upper edge of the assigned NR UL channel bandwidth frequency is equal to or less than 1460MHz.  NOTE 46: Applicable for 5MHz bandwidth and when the NR carrier is within 1447.9 – 1462.9 MHz. | | | | | | | |

Table 6.5.3.2.3-3: Requirements for spurious emissions for UE co-existence Rel-17

| NR Band | Spurious emission for UE co-existence | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | Protected band | Frequency range (MHz) | | | Maximum Level (dBm) | MBW (MHz) | NOTE |
| n1, n84 | E-UTRA Band 1, 5, 7, 8, 11, 18, 19, 20, 21, 22, 26, 27, 28, 31, 32, 38, 40, 41, 42, 43, 44, 45, 50, 51, 52, 65, 67, 68, 69, 72, 73, 74, 75, 76,  NR Band n78, n79, n100 | FDL\_low | - | FDL\_high | -50 | 1 |  |
|  | NR Band n77 | FDL\_low | - | FDL\_high | -50 | 1 | 2 |
|  | E-UTRA Band 3 | FDL\_low | - | FDL\_high | -50 | 1 | 15 |
|  | E-UTRA Band 34 | FDL\_low | - | FDL\_high | -50 | 1 | 15, 43 |
|  | Frequency range | 1880 | - | 1895 | -40 | 1 | 15, 27 |
|  | Frequency range | 1895 | - | 1915 | -15.5 | 5 | 15, 26, 27 |
|  | Frequency range | 1915 | - | 1920 | +1.6 | 5 | 15, 26, 27 |
| n2 | E-UTRA Band 4, 5, 7, 12, 13, 14, 17, 24, 26, 27, 28, 29, 30, 41, 42, 50, 51, 53, 66, 70, 71, 74, 85, 103 | FDL\_low | - | FDL\_high | -50 | 1 |  |
|  | E-UTRA Band 2, 25 | FDL\_low | - | FDL\_high | -50 | 1 | 15 |
|  | E-UTRA Band 43, 48  NR Band n77 | FDL\_low | - | FDL\_high | -50 | 1 | 2 |
| n3, n80 | E-UTRA Band 1, 5, 7, 8, 20, 26, 27, 28, 31, 32, 33, 34, 38, 39, 40, 41, 43, 44, 45, 50, 51, 65, 67, 68, 69, 72, 73,74, 75, 76.  NR Band n79, n100, n101 | FDL\_low | - | FDL\_high | -50 | 1 |  |
|  | E-UTRA Band 3 | FDL\_low | - | FDL\_high | -50 | 1 | 15 |
|  | E-UTRA Band 11, 18, 19, 21 | FDL\_low | - | FDL\_high | -50 | 1 |  |
|  | E-UTRA Band 22, 42, 52  NR Band n77, n78 | FDL\_low | - | FDL\_high | -50 | 1 | 2 |
|  | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8 |
| n5, n89 | E-UTRA Band 1, 2, 3, 4, 5, 7, 8, 12, 13, 14, 17, 18, 19, 24, 25, 26, 28, 29, 30, 31, 34, 38, 40, 42, 43, 45, 48, 50, 51, 65, 66, 70, 71, 73, 74, 85, 103  NR Band n79 | FDL\_low | - | FDL\_high | -50 | 1 |  |
|  | E-UTRA Band 41, 52, 53  NR Band n77, n78 | FDL\_low | - | FDL\_high | -50 | 1 | 2 |
|  | E-UTRA Band 11, 21 | FDL\_low | - | FDL\_high | -50 | 1 |  |
|  | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8 |
| n7 | E-UTRA Band 1, 2, 3, 4, 5, 7, 8, 12, 13, 14, 17, 20, 22, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 40, 42, 43, 50, 51, 52, 65, 66, 67, 68, 71, 72, 74, 75, 76, 85, 103  NR Band n77, n78, n100, n101 | FDL\_low | - | FDL\_high | -50 | 1 |  |
|  | NR Band n79 | FDL\_low | - | FDL\_high | -50 | 1 | 2 |
|  | Frequency range | 2570 | - | 2575 | +1.6 | 5 | 15, 21, 26 |
|  | Frequency range | 2575 | - | 2595 | -15.5 | 5 | 15, 21, 26 |
|  | Frequency range | 2595 | - | 2620 | -40 | 1 | 15, 21 |
| n8, n81, n93, n94 | E-UTRA Band 1, 20, 28, 31, 32, 33, 34, 38, 39, 40, 45, 50, 51, 65, 67, 68, 69, 72, 73, 74, 75, 76  NR Band n101 | FDL\_low | - | FDL\_high | -50 | 1 |  |
|  | E-UTRA band 3, 7, 22, 41, 42, 43, 52,  NR Band n77, n78, n79 | FDL\_low | - | FDL\_high | -50 | 1 | 2 |
|  | E-UTRA 8 | FDL\_low | - | FDL\_high | -50 | 1 | 15 |
|  | E-UTRA Band 11, 21 | FDL\_low | - | FDL\_high | -50 | 1 |  |
|  | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8 |
| n12 | E-UTRA Band 2, 5, 13, 14, 17, 24, 25, 26, 27, 30, 41, 53, 70, 71, 74, 103 | FDL\_low | - | FDL\_high | -50 | 1 |  |
|  | E-UTRA Band 4, 48, 50, 51, 66  NR Band n77 | FDL\_low | - | FDL\_high | -50 | 1 | 2 |
|  | E-UTRA Band 12, 85 | FDL\_low | - | FDL\_high | -50 | 1 | 15 |
| n13 | E-UTRA Band 2, 4, 5,12, 13, 17, 25, 26, 27, 29, 41, 48, 50, 51, 53, 66, 70, 71, 74, 85 | FDL\_low | - | FDL\_high | -50 | 1 |  |
|  | E-UTRA Band 14, 103 | FDL\_low | - | FDL\_high | -50 | 1 | 15 |
|  | E-UTRA Band 24, 30  NR Band n77 | FDL\_low | - | FDL\_high | -50 | 1 | 2 |
|  | Frequency range | 769 | - | 775 | -35 | 0.00625 | 15 |
|  | Frequency range | 799 | - | 805 | -35 | 0.00625 | 11, 15 |
| n14 | E-UTRA Band 2, 4, 5, 12, 13, 14, 17, 23, 24, 25, 26, 27, 29, 30, 41, 48, 53, 66, 70, 71, 85, 103 | FDL\_low | - | FDL\_high | -50 | 1 |  |
|  | NR Band n77 | FDL\_low | - | FDL\_high | -50 | 1 | 2 |
|  | Frequency range | 769 | - | 775 | -35 | 0.00625 | 12, 15 |
|  | Frequency range | 799 | - | 805 | -35 | 0.00625 | 11, 12, 15 |
| n18 | E-UTRA Band 1, 3, 11, 21, 34, 40, 42, 65  NR Band n79 | FDL\_low | - | FDL\_high | -50 | 1 |  |
|  | NR Band n77, n78 | FDL\_low | - | FDL\_high | -50 | 1 | 2 |
|  | Frequency range | 758 | - | 799 | -50 | 1 |  |
|  | Frequency range | 799 | - | 803 | -40 | 1 |  |
|  | Frequency range | 860 | - | 890 | -40 | 1 |  |
|  | Frequency range | 945 | - | 960 | -50 | 1 |  |
|  | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8 |
|  | Frequency range | 2545 | - | 2575 | -50 | 1 |  |
|  | Frequency range | 2595 | - | 2645 | -50 | 1 |  |
| n20, n82, n91, n92 | E-UTRA Band 1, 3, 7, 8, 22, 31, 32, 33, 34, 40, 43, 50, 51, 65, 67, 68, 72, 74, 75, 76  NR Band n100, n101 | FDL\_low | - | FDL\_high | -50 | 1 |  |
|  | E-UTRA Band 20 | FDL\_low | - | FDL\_high | -50 | 1 | 15 |
|  | E-UTRA Band 38, 42, 52, 69,  NR Band n77, n78 | FDL\_low | - | FDL\_high | -50 | 1 | 2 |
|  | Frequency range | 758 | - | 788 | -50 | 1 |  |
| n24, n99 | E-UTRA Band 2, 4, 5, 10, 12, 13, 14, 17, 24, 25, 26, 29, 30, 41, 48, 66, 70, 71, 85, 103 | FDL\_low | - | FDL\_high | -50 | 1 |  |
|  | NR Band n77 | FDL\_low | - | FDL\_high | -50 | 1 | 2 |
| n25 | E-UTRA Band 4, 5, 7, 12, 13, 14, 17, 24, 26, 27, 28, 29, 30, 41, 42, 53, 66, 70, 71, 85, 103 | FDL\_low | - | FDL\_high | -50 | 1 |  |
|  | E-UTRA Band 2 | FDL\_low | - | FDL\_high | -50 | 1 | 15 |
|  | E-UTRA Band 25 | FDL\_low | - | FDL\_high | -50 | 1 | 15 |
|  | E-UTRA Band 43, 48  NR Band n77 | FDL\_low | - | FDL\_high | -50 | 1 | 2 |
| n26 | E-UTRA Band 1, 2, 3, 4, 5, 11, 12, 13, 14, 17, 18,19, 21, 24, 25, 26, 29, 30, 31, 34, 39, 40, 42, 43, 48, 50, 51, 65, 66, 70, 71, 73,74, 85, 103 | FDL\_low | - | FDL\_high | -50 | 1 |  |
|  | E-UTRA Band 41, 53  NR Band n77, n78, n79 | FDL\_low | - | FDL\_high | -50 | 1 | 2 |
|  | Frequency range | 703 | - | 799 | -50 | 1 |  |
|  | Frequency range | 799 | - | 803 | -40 | 1 | 15 |
|  | Frequency range | 945 | - | 960 | -50 | 1 |  |
|  | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8 |
| n28, n83 | E-UTRA Band 1, 4, 22, 32, 42, 43, 50, 51, 65, 66, 74, 75, 76  NR Band n77, n78, n100, n101 | FDL\_low | - | FDL\_high | -50 | 1 | 2 |
|  | E-UTRA Band 1 | FDL\_low | - | FDL\_high | -50 | 1 | 19, 25 |
|  | E-UTRA Band 2, 3, 5, 7, 8, 18, 19, 20, 25, 26, 27, 31, 34, 38, 39, 40, 41, 52, 72, 73  NR Band n79 | FDL\_low | - | FDL\_high | -50 | 1 |  |
|  | E-UTRA Band 11, 21 | FDL\_low | - | FDL\_high | -50 | 1 | 19, 24 |
|  | Frequency range | 470 | - | 694 | -42 | 8 | 15, 35 |
|  | Frequency range | 470 | - | 710 | -26.2 | 6 | 34 |
|  | Frequency range | 662 | - | 694 | -26.2 | 6 | 15 |
|  | Frequency range | 758 | - | 773 | -32 | 1 | 15 |
|  | Frequency range | 773 | - | 803 | -50 | 1 |  |
|  | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8, 19 |
| n30 | E-UTRA Band 2, 4, 5, 7, 12, 13, 14, 17, 24, 25, 26, 27, 29, 30, 38, 41, 48, 53, 66, 70, 71, 85, 103  NR Band n77 | FDL\_low | - | FDL\_high | -50 | 1 |  |
| n34 | E-UTRA Band 1, 3, 7, 8, 11, 18, 19, 20, 21, 22, 26, 28, 31, 32, 33, 38,39, 40, 41, 42, 43, 44, 45, 50, 51, 52, 65, 67, 69, 72, 74, 75, 76  NR Band n78, n79, n100, n101 | FDL\_low | - | FDL\_high | -50 | 1 | 5 |
|  | NR Band n77 | FDL\_low | - | FDL\_high | -50 | 1 | 2 |
|  | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8 |
| n38 | E-UTRA Band 1, 2, 3, 4, 5, 8, 12, 13, 14, 17, 20, 22, 27, 28, 29, 30, 31, 32, 33, 34, 40, 42, 43, 50, 51, 52, 65, 66, 67, 68, 72, 74, 75, 76, 85, 103  NR Band n100, n101 | FDL\_low | - | FDL\_high | -50 | 1 |  |
|  | NR Band n77, n78, n79 | FDL\_low | - | FDL\_high | -50 | 1 |  |
|  | Frequency range | 2620 | - | 2645 | -15.5 | 5 | 15, 22, 26 |
|  | Frequency range | 2645 | - | 2690 | -40 | 1 | 15, 22 |
| n39, n98 | E-UTRA Band 1, 8, 22, 26, 28, 34, 40, 41, 42, 44, 45, 50, 51, 52, 74  NR Band n79 | FDL\_low | - | FDL\_high | -50 | 1 |  |
|  | NR Band n77, n78 | FDL\_low | - | FDL\_high | -50 | 1 | 2 |
|  | Frequency range | 1805 | - | 1855 | -40 | 1 | 33 |
|  | Frequency range | 1855 | - | 1880 | -15.5 | 5 | 15, 26, 33 |
| n40, n97 | E-UTRA Band 1, 3, 5, 7, 8, 11, 18, 19, 20, 21, 22, 26, 27, 28, 31, 32, 33, 34, 38, 39, 41, 42, 43, 44, 45, 50, 51, 52, 65, 67, 68, 69, 72, 74, 75, 76  NR Band n77, n78, n100, n101 | FDL\_low | - | FDL\_high | -50 | 1 | 44 |
|  | NR Band n79 | FDL\_low | - | FDL\_high | -50 | 1 | 2 |
|  | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8 |
| n41 | E-UTRA Band 1, 2, 3, 4, 5, 8, 12, 13, 14, 17, 24, 25, 26, 27, 28, 29, 30, 34, 39, 42, 44, 45, 48, 50, 51, 52, 65, 66, 70, 71, 73, 74, 85, 103  NR Band n77, n78 | FDL\_low | - | FDL\_high | -50 | 1 |  |
|  | E-UTRA Band 40 | FDL\_low | - | FDL\_high | -40 | 1 |  |
|  | NR Band n79 | FDL\_low | - | FDL\_high | -50 | 1 | 2 |
|  | E-UTRA Band 11, 18, 19, 21 | FDL\_low | - | FDL\_high | -50 | 1 |  |
|  | Frequency range | 1884.5 |  | 1915.7 | -41 | 0.3 | 8 |
| n47 | E-UTRA Band 1, 3, 5, 7, 8, 22, 26, 28, 34, 39, 40, 41, 42, 44, 45, 65, 68, 72, 73 | FDL\_low | - | FDL\_high | -50 | 1 |  |
|  | NR Band n71, n77, n78, n79 | FDL\_low | - | FDL\_high | -50 | 1 |  |
| n48 | E-UTRA Band 2, 4, 5, 12, 13, 14, 17, 24, 25, 26, 29, 30, 41, 50, 51, 66, 70, 71, 74, 85, 103 | FDL\_low | - | FDL\_high | -50 | 1 |  |
| n50 | E-UTRA Band 1, 2, 3, 4, 5, 7, 8, 12, 13, 17, 20, 26, 28, 29, 31, 34, 38, 39, 40, 41, 42, 43, 48, 65, 66, 67, 68, 103  NR Band n100, n101 | FDL\_low | - | FDL\_high | -50 | 1 |  |
| n51 | E-UTRA Band 1, 2, 3, 4, 5, 7, 8, 12, 13, 17, 20, 26, 28, 29, 31, 34, 38, 39, 40, 41, 42, 43, 48, 52, 65, 66, 67, 68, 85, 103  NR Band n100, n101 | FDL\_low | - | FDL\_high | -50 | 1 |  |
| n53 | E-UTRA Band 2, 4, 5, 12, 13, 14, 17, 24, 25, 26, 29, 30, 48, 66, 70, 71, 85, 103  NR Band n77 | FDL\_low | - | FDL\_high | -50 | 1 |  |
| n65 | E-UTRA Band 1, 3, 5, 7, 8, 11, 18, 19, 20, 21, 22, 26, 27, 28, 31, 32, 38, 40, 41, 42, 43, 50, 51, 65, 68, 69, 72, 74, 75, 76  NR Band n78, n79, n100 | FDL\_low | - | FDL\_high | -50 | 1 |  |
|  | NR Band n77 | FDL\_low | - | FDL\_high | -50 | 1 | 2 |
|  | E-UTRA Band 34 | FDL\_low | - | FDL\_high | -50 | 1 | 43 |
|  | Frequency range | 1900 | - | 1915 | -15.5 | 5 | 15, 26, 27 |
|  | Frequency range | 1915 | - | 1920 | +1.6 | 5 | 15, 26, 27 |
| n66, n86 | E-UTRA Band 2, 4, 5, 7, 12, 13, 14, 17, 25, 26, 27, 28, 29, 30, 38, 41, 43, 50, 51, 53, 66, 70, 71, 74, 85, 103 | FDL\_low | - | FDL\_high | -50 | 1 |  |
|  | E-UTRA Band 42, 48,  NR Band n77 | FDL\_low | - | FDL\_high | -50 | 1 | 2 |
| n70 | E-UTRA Band 2, 4, 5, 12, 13, 14, 17, 24, 25, 26, 29, 30, 41, 47, 48, 66, 70, 71, 85, 103 | FDL\_low | - | FDL\_high | -50 | 1 |  |
|  | NR Band n77 | FDL\_low | - | FDL\_high | -50 | 1 | 2 |
| n71 | E-UTRA Band 4, 5, 12, 13, 14, 17, 24, 26, 30, 48, 53, 66, 85, 103 | FDL\_low | - | FDL\_high | -50 | 1 |  |
|  | E-UTRA Band 2, 7, 25, 41, 70,  NR Band n77 | FDL\_low | - | FDL\_high | -50 | 1 | 2 |
|  | E-UTRA Band 29 | FDL\_low | - | FDL\_high | -38 | 1 | 15 |
|  | E-UTRA Band 71 | FDL\_low | - | FDL\_high | -50 | 1 | 15 |
| n74 | E-UTRA Band 1, 2, 3, 4, 5, 7, 8, 12, 13, 17, 18, 19, 20, 26, 28, 29, 31, 34, 38, 39, 40, 41, 42, 43, 48, 52, 65, 66, 67, 68, 85, 103  NR Band n77, n78, n100, n101 | FDL\_low | - | FDL\_high | -50 | 1 |  |
|  | NR Band n79 | FDL\_low | - | FDL\_high | -50 | 1 | 2 |
|  | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8 |
|  | Frequency range | 1400 | - | 1427 | -32 | 27 | 15, 41 |
|  | Frequency range | 1475 | - | 1488 | -28 | 1 | 15, 42 |
|  | Frequency range | 1475 | - | 1488 | -50 | 1 | 15, 45 |
|  | Frequency range | 1475.9 | - | 1510.9 | -35 | 1 | 15, 46 |
|  | Frequency range | 1488 | - | 1518 | -50 | 1 | 15 |
| n77 | E-UTRA Band 1, 2, 3, 4, 5, 7, 8, 11, 12, 13, 14, 17, 18, 19, 20, 21, 24, 25, 26, 27, 28, 29, 30, 34, 39, 40, 41, 53, 65, 66, 70, 71, 74, 85, 103  NR Band n100, n101 | FDL\_low | - | FDL\_high | -50 | 1 |  |
|  | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8 |
| n78 | E-UTRA Band 1, 2, 3, 5, 7, 8, 11, 18, 19, 20, 21, 25, 26, 28, 32, 34, 39, 40, 41, 65, 66, 74, 75, 76  NR Band n100, n101 | FDL\_low | - | FDL\_high | -50 | 1 |  |
|  | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8 |
| n79 | E-UTRA Band 1, 3, 5, 7, 8, 11, 18, 19, 21, 28, 34, 39, 40, 41, 42, 65, 74 | FDL\_low | - | FDL\_high | -50 | 1 |  |
|  | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8 |
| n85 | E-UTRA Band 2, 5, 13, 14, 17, 24, 25, 26, 27, 30, 41, 53, 70, 71, 74, 103 | FDL\_low | - | FDL\_high | -50 | 1 |  |
|  | E-UTRA Band 4, 48, 50, 51, 66  NR Band n77, n78 | FDL\_low | - | FDL\_high | -50 | 1 | 2 |
|  | E-UTRA Band 12, 85 | FDL\_low | - | FDL\_high | -50 | 1 | 15 |
| n95 | E-UTRA Band 1, 3 , 5, 8, 28, 39, 40, 41  NR Band n78, n79 | FDL\_low | - | FDL\_high | -50 | 1 | 5 |
|  | NR Band n77 | FDL\_low | - | FDL\_high | -50 | 1 | 2 |
|  | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8 |
| n100 | E-UTRA Band 1, 3, 8, 20, 28, 31, 32, 33, 34, 38, 40, 43, 50, 51, 52, 65, 67, 68, 69, 72, 74, 75, 76  NR Band n101 | FDL\_low | - | FDL\_high | -50 | 1 |  |
| E-UTRA Band 7, 22, 42  NR Band n77, n78 | FDL\_low | - | FDL\_high | -50 | 1 | 2 |
| Frequency range | 758 | - | 788 | -50 | 1 |  |
| n101 | E-UTRA Band 1, 3, 8, 20, 22,  28, 31, 32, 34, 38, 40,  50, 51, 52, 65, 67, 68, 69, 72,  74, 75, 76  NR Band n100 | FDL\_low | - | FDL\_high | -50 | 1 |  |
|  | E-UTRA Band 7, 42, 43  NR Band n77, n78 | FDL\_low | - | FDL\_high | -50 | 1 | 2 |
|  | Frequency range | 758 | - | 788 | -50 | 1 |  |
| NOTE 1: FDL\_low and FDL\_high refer to each frequency band specified in Table 5.2-1 in TS 38.101-1 [2] or Table 5.5-1 in TS 36.101  NOTE 2: As exceptions, measurements with a level up to the applicable requirements defined in Table 6.5.3.1-2 are permitted for each assigned NR carrier used in the measurement due to 2nd, 3rd, 4th or 5th harmonic spurious emissions. Due to spreading of the harmonic emission the exception is also allowed for the first 1 MHz frequency range immediately outside the harmonic emission on both sides of the harmonic emission. This results in an overall exception interval centred at the harmonic emission of (2 MHz + N x LCRB x RBsize kHz), where N is 2, 3, 4, 5 for the 2nd, 3rd, 4th or 5th harmonic respectively. The exception is allowed if the measurement bandwidth (MBW) totally or partially overlaps the overall exception interval.  NOTE 3: 15 kHz SCS is assumed when RB is mentioned in the note when channel bandwidth is less than or equal to 50 MHz, lowest SCS is assumed when channel bandwidth is larger than 50 MHz. The transmission bandwidth in terms of RB position and range is not limited to 15 kHz SCS and shall scale with SCS accordingly.  NOTE 4: Void  NOTE 5: For non-synchronised TDD operation to meet these requirements some restriction will be needed for either the operating band or protected band  NOTE 6: N/A  NOTE 7: Void  NOTE 8: Applicable when co-existence with PHS system operating in 1884.5 - 1915.7 MHz.  NOTE 9: Void  NOTE 10: Void  NOTE 11: Void  NOTE 12: The emissions measurement shall be sufficiently power averaged to ensure a standard deviation < 0.5 dB  NOTE 13: Void  NOTE 14: Void  NOTE 15: These requirements also apply for the frequency ranges that are less than FOOB (MHz) in Table 6.5.3.1-1 from the edge of the channel bandwidth.  NOTE 16: Void  NOTE 17: Void  NOTE 18: Void  NOTE 19: Applicable when the assigned NR carrier is confined within 718 MHz and 748 MHz and when the channel bandwidth used is 5 or 10 MHz.  NOTE 20: Void  NOTE 21: This requirement is applicable for any channel bandwidths up to 20MHz within the range 2500 - 2570 MHz with the following restriction: for carriers of 15 MHz bandwidth when carrier centre frequency is within the range 2560.5 - 2562.5 MHz and for carriers of 20 MHz bandwidth when carrier centre frequency is within the range 2552 - 2560 MHz the requirement is applicable only for an uplink transmission bandwidth less than or equal to 54 RB.  NOTE 22: This requirement is applicable for power class 3 UE for any channel bandwidths up to 20 MHz. For channel bandwidth within the range 2570 - 2615 MHz with the following restriction: for carriers of 15 MHz bandwidth when the carrier centre frequency is within the range 2605.5 - 2607.5 MHz and for carriers of 20 MHz bandwidth when the carrier centre frequency is within the range 2597 - 2605 MHz the requirement is applicable only for an uplink transmission bandwidth less than or equal to 54 RB. For carriers overlapping the frequency range 2615 - 2620 MHz the requirement applies with the maximum output power configured to +19 dBm in the IE P-Max.  NOTE 23: Void  NOTE 24: As exceptions, measurements with a level up to the applicable requirement of -38 dBm/MHz is permitted for each assigned NR carrier used in the measurement due to 2nd harmonic spurious emissions. An exception is allowed if there is at least one individual RB within the transmission bandwidth (see Figure 5.3.1-1) for which the 2nd harmonic totally or partially overlaps the measurement bandwidth (MBW).  NOTE 25: As exceptions, measurements with a level up to the applicable requirement of -36 dBm/MHz is permitted for each assigned NR carrier used in the measurement due to 3rd harmonic spurious emissions. An exception is allowed if there is at least one individual RB within the transmission bandwidth (see Figure 5.3.1-1) for which the 3rd harmonic totally or partially overlaps the measurement bandwidth (MBW).  NOTE 26: For these adjacent bands, the emission limit could imply risk of harmful interference to UE(s) operating in the protected operating band.  NOTE 27: This requirement is applicable for channel bandwidths up to 20 MHz within the range 1920 - 1980 MHz with the following restriction: for carriers of 15 MHz bandwidth when the carrier centre frequency is within the range 1927.5 - 1929.5 MHz and for carriers of 20 MHz bandwidth when the carrier centre frequency is within the range 1930 - 1938 MHz the requirement is applicable only for an uplink transmission bandwidth less than or equal to 54 RB.  NOTE 28: Void  NOTE 29: Void  NOTE 30: Void  NOTE 31: Void  NOTE 32: Void  NOTE 33: This requirement is only applicable for carriers with bandwidth up to 20MHz and confined within 1885-1920 MHz (requirement for carriers with at least 1RB confined within 1880 - 1885 MHz is not specified). This requirement applies for an uplink transmission bandwidth less than or equal to 54 RB for carriers of 15 MHz bandwidth when carrier center frequency is within the range 1892.5 - 1894.5 MHz and for carriers of 20 MHz bandwidth when carrier center frequency is within the range 1895 - 1903 MHz. The above restriction is applicable to only power class 3 UEs.  NOTE 34: This requirement is applicable for 5 and 10 MHz NR channel bandwidth allocated within 718-728 MHz. For carriers of 10 MHz bandwidth, this requirement applies for an uplink transmission bandwidth less than or equal to 30 RB with RBstart > 1 and RBstart < 48.  NOTE 35: This requirement is applicable in the case of a 10 MHz NR carrier confined within 703 MHz and 733 MHz, otherwise the requirement of -25 dBm with a measurement bandwidth of 8 MHz applies.  NOTE 36: Void  NOTE 37: Void  NOTE 38: Void  NOTE 39: Void  NOTE 40: Void  NOTE 41: Applicable for cases and when the lower edge of the assigned NR UL channel bandwidth frequency is greater than or equal to 1427 MHz + the channel BW assigned for 5 and 10 MHz bandwidth, and when the lower edge of the assigned NR UL channel bandwidth frequency is greater than or equal to 1440 MHz for 15 and 20 MHz bandwidth. This requirement shall be verified with UE transmission power configured as high as possible but no higher than 15 dBm.  NOTE 42: Applicable when upper edge of the assigned NR UL channel bandwidth frequency is more than 1460 MHz and less than or equal to 1470 MHz for 5 MHz bandwidth, and when the upper edge of the assigned NR UL channel bandwidth frequency is more than 1460 MHz and less than or equal to 1465 MHz for 10 MHz bandwidth.  NOTE 43: This requirement is applicable for UE which is operating in power class 3 and NR channel bandwidths up to 20 MHz within frequency range 1920-1980 MHz.  NOTE 44: As exceptions, for 90 and 100 MHz channel bandwidth, -40 dBm/MHz is applicable in the frequency range of 2496 – 2505 MHz.  NOTE 45: Applicable when upper edge of the assigned NR UL channel bandwidth frequency is equal to or less than 1460 MHz.  NOTE 46: Applicable for 5 MHz bandwidth and when the NR carrier is within 1447.9 – 1462.9 MHz. | | | | | | | |

Table 6.5.3.2.3-4: Requirements for spurious emissions for UE co-existence Rel-18

| NR Band | Spurious emission for UE co-existence | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | Protected band | Frequency range (MHz) | | | Maximum Level (dBm) | MBW (MHz) | NOTE |
| n1, n84 | E-UTRA Band 1, 5, 7, 8, 11, 18, 19, 20, 21, 22, 26, 27, 28, 31, 32, 38, 40, 41, 42, 43, 44, 45, 50, 51, 52, 65, 67, 68, 69, 72, 73, 74, 75, 76,  NR Band n78, n79, n100 | FDL\_low | - | FDL\_high | -50 | 1 |  |
|  | NR Band n77 | FDL\_low | - | FDL\_high | -50 | 1 | 2 |
|  | E-UTRA Band 3 | FDL\_low | - | FDL\_high | -50 | 1 | 15 |
|  | E-UTRA Band 34 | FDL\_low | - | FDL\_high | -50 | 1 | 15, 43 |
|  | Frequency range | 1880 | - | 1895 | -40 | 1 | 15, 27 |
|  | Frequency range | 1895 | - | 1915 | -15.5 | 5 | 15, 26, 27 |
|  | Frequency range | 1915 | - | 1920 | +1.6 | 5 | 15, 26, 27 |
| n2 | E-UTRA Band 4, 5, 7, 12, 13, 14, 17, 24, 26, 27, 28, 29, 30, 38, 41, 42, 50, 51, 53, 54, 66, 70, 71, 74, 85, 103 | FDL\_low | - | FDL\_high | -50 | 1 |  |
|  | E-UTRA Band 2, 25 | FDL\_low | - | FDL\_high | -50 | 1 | 15 |
|  | E-UTRA Band 43, 48  NR Band n77, n78 | FDL\_low | - | FDL\_high | -50 | 1 | 2 |
| n3, n80 | E-UTRA Band 1, 5, 7, 8, 20, 26, 27, 28, 31, 32, 33, 34, 38, 39, 40, 41, 43, 44, 45, 50, 51, 65, 67, 68, 69, 72, 73,74, 75, 76.  NR Band n79, n100, n101 | FDL\_low | - | FDL\_high | -50 | 1 |  |
|  | E-UTRA Band 3 | FDL\_low | - | FDL\_high | -50 | 1 | 15 |
|  | E-UTRA Band 11, 18, 19, 21 | FDL\_low | - | FDL\_high | -50 | 1 |  |
|  | E-UTRA Band 22, 42, 52,  NR Band n77, n78 | FDL\_low | - | FDL\_high | -50 | 1 | 2 |
|  | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8 |
| n5, n89 | E-UTRA Band 1, 2, 3, 4, 5, 7, 8, 12, 13, 14, 17, 18, 19, 24, 25, 28, 29, 30, 31, 34, 38, 40, 42, 43, 45, 48, 50, 51, 65, 66, 70, 71, 73, 74, 85, 103  NR Band n79 | FDL\_low | - | FDL\_high | -50 | 1 |  |
|  | E-UTRA Band 41, 52, 53, 54  NR Band n77, n78 | FDL\_low | - | FDL\_high | -50 | 1 | 2 |
|  | E-UTRA Band 11, 21 | FDL\_low | - | FDL\_high | -50 | 1 |  |
|  | E-UTRA Band 26 | FDL\_low | - | FDL\_high | -50 | 1 | 15 |
|  | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8 |
| n7 | E-UTRA Band 1, 2, 3, 4, 5, 7, 8, 12, 13, 14, 17, 20, 22, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 40, 42, 43, 50, 51, 52, 65, 66, 67, 68, 71, 72, 74, 75, 76, 85, 103  NR Band n77, n78, n100, n101 | FDL\_low | - | FDL\_high | -50 | 1 |  |
|  | NR Band n79 | FDL\_low | - | FDL\_high | -50 | 1 | 2 |
|  | Frequency range | 2570 | - | 2575 | +1.6 | 5 | 15, 21, 26 |
|  | Frequency range | 2575 | - | 2595 | -15.5 | 5 | 15, 21, 26 |
|  | Frequency range | 2595 | - | 2620 | -40 | 1 | 15, 21 |
| n8, n81, n93, n94 | E-UTRA Band 1, 20, 28, 31, 32, 33, 34, 38, 39, 40, 45, 50, 51, 54, 65, 67, 68, 69, 72, 73, 74, 75, 76  NR Band n101 | FDL\_low | - | FDL\_high | -50 | 1 |  |
|  | E-UTRA band 3, 7, 22, 41, 42, 43, 52  NR Band n77, n78, n79 | FDL\_low | - | FDL\_high | -50 | 1 | 2 |
|  | E-UTRA 8 | FDL\_low | - | FDL\_high | -50 | 1 | 15 |
|  | E-UTRA Band 11, 21 | FDL\_low | - | FDL\_high | -50 | 1 |  |
|  | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8 |
| n12 | E-UTRA Band 2, 5, 13, 14, 17, 24, 25, 26, 27, 30, 41, 53, 54, 70, 71, 74, 103 | FDL\_low | - | FDL\_high | -50 | 1 |  |
|  | E-UTRA Band 4, 48, 50, 51, 66  NR Band n77 | FDL\_low | - | FDL\_high | -50 | 1 | 2 |
|  | E-UTRA Band 12, 85 | FDL\_low | - | FDL\_high | -50 | 1 | 15 |
| n13 | E-UTRA Band 2, 4, 5,12, 13, 17, 25, 26, 27, 29, 41, 48, 50, 51, 53, 54, 66, 70, 71, 74, 85 | FDL\_low | - | FDL\_high | -50 | 1 |  |
|  | E-UTRA Band 14, 103 | FDL\_low | - | FDL\_high | -50 | 1 | 15 |
|  | E-UTRA Band 24, 30  NR Band n77 | FDL\_low | - | FDL\_high | -50 | 1 | 2 |
|  | Frequency range | 769 | - | 775 | -35 | 0.00625 | 15 |
|  | Frequency range | 799 | - | 805 | -35 | 0.00625 | 11, 15 |
| n14 | E-UTRA Band 2, 4, 5, 12, 13, 14, 17, 23, 24, 25, 26, 27, 29, 30, 41, 48, 53, 54, 66, 70, 71, 85, 103 | FDL\_low | - | FDL\_high | -50 | 1 |  |
|  | NR Band n77 | FDL\_low | - | FDL\_high | -50 | 1 | 2 |
|  | Frequency range | 769 | - | 775 | -35 | 0.00625 | 12, 15 |
|  | Frequency range | 799 | - | 805 | -35 | 0.00625 | 11, 12, 15 |
| n18 | E-UTRA Band 1, 3, 11, 21, 34, 40, 42, 65  NR Band n79 | FDL\_low | - | FDL\_high | -50 | 1 |  |
|  | NR Band n77, n78 | FDL\_low | - | FDL\_high | -50 | 1 | 2 |
|  | Frequency range | 758 | - | 799 | -50 | 1 |  |
|  | Frequency range | 799 | - | 803 | -40 | 1 |  |
|  | Frequency range | 860 | - | 890 | -40 | 1 |  |
|  | Frequency range | 945 | - | 960 | -50 | 1 |  |
|  | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8 |
|  | Frequency range | 2545 | - | 2575 | -50 | 1 |  |
|  | Frequency range | 2595 | - | 2645 | -50 | 1 |  |
| n20, n82, n91, n92 | E-UTRA Band 1, 3, 7, 8, 22, 31, 32, 33, 34, 40, 43, 50, 51, 65, 67, 68, 72, 74, 75, 76  NR Band n100, n101 | FDL\_low | - | FDL\_high | -50 | 1 |  |
|  | E-UTRA Band 20 | FDL\_low | - | FDL\_high | -50 | 1 | 15 |
|  | E-UTRA Band 38, 42, 52, 69,  NR Band n77, n78 | FDL\_low | - | FDL\_high | -50 | 1 | 2 |
|  | Frequency range | 758 | - | 788 | -50 | 1 |  |
| n24, n99 | E-UTRA Band 2, 4, 5, 10, 12, 13, 14, 17, 24, 25, 26, 29, 30, 41, 48, 66, 70, 71, 85, 103 | FDL\_low | - | FDL\_high | -50 | 1 |  |
|  | NR Band n77 | FDL\_low | - | FDL\_high | -50 | 1 | 2 |
| n25 | E-UTRA Band 4, 5, 7, 12, 13, 14, 17, 24, 26, 27, 28, 29, 30, 38, 41, 42, 53, 54, 66, 70, 71, 85, 103 | FDL\_low | - | FDL\_high | -50 | 1 |  |
|  | E-UTRA Band 2 | FDL\_low | - | FDL\_high | -50 | 1 | 15 |
|  | E-UTRA Band 25 | FDL\_low | - | FDL\_high | -50 | 1 | 15 |
|  | E-UTRA Band 43, 48  NR Band n77, n78 | FDL\_low | - | FDL\_high | -50 | 1 | 2 |
| n26 | E-UTRA Band 1, 2, 3, 4, 5, 7, 11, 12, 13, 14, 17, 18,19, 21, 24, 25, 29, 30, 31, 34, 39, 40, 42, 43, 48, 50, 51, 65, 66, 70, 71, 73,74, 85, 103 | FDL\_low | - | FDL\_high | -50 | 1 |  |
|  | E-UTRA Band 41, 53, 54  NR Band n77, n78, n79 | FDL\_low | - | FDL\_high | -50 | 1 | 2 |
|  | E-UTRA Band 26 | FDL\_low | - | FDL\_high | -50 | 1 | 15 |
|  | Frequency range | 703 | - | 799 | -50 | 1 |  |
|  | Frequency range | 799 | - | 803 | -40 | 1 | 15 |
|  | Frequency range | 945 | - | 960 | -50 | 1 |  |
|  | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8 |
| n28, n83 | E-UTRA Band 1, 4, 22, 32, 42, 43, 50, 51, 65, 66, 74, 75, 76,  NR Band n77, n78, n100, n101 | FDL\_low | - | FDL\_high | -50 | 1 | 2 |
|  | E-UTRA Band 1 | FDL\_low | - | FDL\_high | -50 | 1 | 19, 25 |
|  | E-UTRA Band 2, 3, 5, 7, 8, 18, 19, 20, 25, 26, 27, 31, 34, 38, 39, 40, 41, 52, 71, 72, 73  NR Band n79 | FDL\_low | - | FDL\_high | -50 | 1 |  |
|  | E-UTRA Band 11, 21 | FDL\_low | - | FDL\_high | -50 | 1 | 19, 24 |
|  | Frequency range | 470 | - | 694 | -42 | 8 | 15, 35 |
|  | Frequency range | 470 | - | 710 | -26.2 | 6 | 34 |
|  | Frequency range | 662 | - | 694 | -26.2 | 6 | 15 |
|  | Frequency range | 758 | - | 773 | -32 | 1 | 15 |
|  | Frequency range | 773 | - | 803 | -50 | 1 |  |
|  | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8, 19 |
| n30 | E-UTRA Band 2, 4, 5, 7, 12, 13, 14, 17, 24, 25, 26, 27, 29, 30, 38, 41, 48, 53, 54, 66, 70, 71, 85, 103  NR Band n77 | FDL\_low | - | FDL\_high | -50 | 1 |  |
| n34 | E-UTRA Band 1, 3, 7, 8, 11, 18, 19, 20, 21, 22, 26, 28, 31, 32, 33, 38,39, 40, 41, 42, 43, 44, 45, 50, 51, 52, 65, 67, 69, 72, 74, 75, 76,  NR Band n78, n79, n100, n101 | FDL\_low | - | FDL\_high | -50 | 1 | 5 |
|  | NR Band n77 | FDL\_low | - | FDL\_high | -50 | 1 | 2 |
|  | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8 |
| n38 | E-UTRA Band 1, 2, 3, 4, 5, 8, 12, 13, 14, 17, 20, 22, 25, 27, 28, 29, 30, 31, 32, 33, 34, 40, 42, 43, 50, 51, 52, 65, 66, 67, 68, 71, 72, 74, 75, 76, 85, 103  NR Band n100, n101 | FDL\_low | - | FDL\_high | -50 | 1 |  |
|  | NR Band n77, n78, n79 | FDL\_low | - | FDL\_high | -50 | 1 |  |
|  | Frequency range | 2620 | - | 2645 | -15.5 | 5 | 15, 22, 26 |
|  | Frequency range | 2645 | - | 2690 | -40 | 1 | 15, 22 |
| n39, n98 | E-UTRA Band 1, 8, 22, 26, 28, 34, 40, 41, 42, 44, 45, 50, 51, 52, 74,  NR Band n79 | FDL\_low | - | FDL\_high | -50 | 1 |  |
|  | NR Band n77, n78 | FDL\_low | - | FDL\_high | -50 | 1 | 2 |
|  | Frequency range | 1805 | - | 1855 | -40 | 1 | 33 |
|  | Frequency range | 1855 | - | 1880 | -15.5 | 5 | 15, 26, 33 |
| n40, n97 | E-UTRA Band 1, 3, 5, 7, 8, 11, 18, 19, 20, 21, 22, 26, 27, 28, 31, 32, 33, 34, 38, 39, 41, 42, 43, 44, 45, 50, 51, 52, 65, 67, 68, 69, 72, 74, 75, 76,  NR Band n77, n78, n100, n101 | FDL\_low | - | FDL\_high | -50 | 1 | 44 |
|  | NR Band n79 | FDL\_low | - | FDL\_high | -50 | 1 | 2 |
|  | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8 |
| n41 | E-UTRA Band 1, 2, 3, 4, 5, 8, 12, 13, 14, 17, 24, 25, 26, 27, 28, 29, 30, 34, 39, 42, 44, 45, 48, 50, 51, 52, 54, 65, 66, 70, 71, 73, 74, 85, 103  NR Band n77, n78 | FDL\_low | - | FDL\_high | -50 | 1 |  |
|  | E-UTRA Band 40 | FDL\_low | - | FDL\_high | -40 | 1 |  |
|  | NR Band n79 | FDL\_low | - | FDL\_high | -50 | 1 | 2 |
|  | E-UTRA Band 11, 18, 19, 21 | FDL\_low | - | FDL\_high | -50 | 1 |  |
|  | Frequency range | 1884.5 |  | 1915.7 | -41 | 0.3 | 8 |
| n47 | E-UTRA Band 1, 3, 5, 7, 8, 22, 26, 28, 34, 39, 40, 41, 42, 44, 45, 65, 68, 72, 73 | FDL\_low | - | FDL\_high | -50 | 1 |  |
|  | NR Band n71, n77, n78, n79 | FDL\_low | - | FDL\_high | -50 | 1 |  |
| n48 | E-UTRA Band 2, 4, 5, 12, 13, 14, 17, 24, 25, 26, 29, 30, 41, 50, 51, 53, 54, 66, 70, 71, 74, 85, 103 | FDL\_low | - | FDL\_high | -50 | 1 |  |
| n50 | E-UTRA Band 1, 2, 3, 4, 5, 7, 8, 12, 13, 17, 20, 26, 28, 29, 31, 34, 38, 39, 40, 41, 42, 43, 48, 65, 66, 67, 68, 103  NR Band n100, n101 | FDL\_low | - | FDL\_high | -50 | 1 |  |
| n51 | E-UTRA Band 1, 2, 3, 4, 5, 7, 8, 12, 13, 17, 20, 26, 28, 29, 31, 34, 38, 39, 40, 41, 42, 43, 48, 52, 65, 66, 67, 68, 85, 103  NR Band n100, n101 | FDL\_low | - | FDL\_high | -50 | 1 |  |
| n53 | E-UTRA Band 2, 4, 5, 12, 13, 14, 17, 24, 25, 26, 29, 30, 48, 54, 66, 70, 71, 85, 103  NR Band n77 | FDL\_low | - | FDL\_high | -50 | 1 |  |
| n65 | E-UTRA Band 1, 3, 5, 7, 8, 11, 18, 19, 20, 21, 22, 26, 27, 28, 31, 32, 38, 40, 41, 42, 43, 50, 51, 65, 68, 69, 72, 74, 75, 76  NR Band n78, n79, n100 | FDL\_low | - | FDL\_high | -50 | 1 |  |
|  | NR Band n77 | FDL\_low | - | FDL\_high | -50 | 1 | 2 |
|  | E-UTRA Band 34 | FDL\_low | - | FDL\_high | -50 | 1 | 43 |
|  | Frequency range | 1900 | - | 1915 | -15.5 | 5 | 15, 26, 27 |
|  | Frequency range | 1915 | - | 1920 | +1.6 | 5 | 15, 26, 27 |
| n66, n86 | E-UTRA Band 2, 4, 5, 7, 12, 13, 14, 17, 25, 26, 27, 28, 29, 30, 38, 41, 43, 50, 51, 53, 66, 70, 71, 74, 85, 103 | FDL\_low | - | FDL\_high | -50 | 1 |  |
|  | E-UTRA Band 42, 48  NR Band n77 | FDL\_low | - | FDL\_high | -50 | 1 | 2 |
| n70 | E-UTRA Band 2, 4, 5, 12, 13, 14, 17, 24, 25, 26, 29, 30, 41, 47, 48, 66, 70, 71, 85, 103 | FDL\_low | - | FDL\_high | -50 | 1 |  |
|  | NR Band n77, n78 | FDL\_low | - | FDL\_high | -50 | 1 | 2 |
| n71 | E-UTRA Band 4, 5, 12, 13, 14, 17, 24, 26, 28, 30, 38, 48, 53, 54, 66, 85, 103 | FDL\_low | - | FDL\_high | -50 | 1 |  |
|  | E-UTRA Band 2, 7, 25, 41, 70,  NR Band n77, n78 | FDL\_low | - | FDL\_high | -50 | 1 | 2 |
|  | E-UTRA Band 29 | FDL\_low | - | FDL\_high | -38 | 1 | 15 |
|  | E-UTRA Band 71 | FDL\_low | - | FDL\_high | -50 | 1 | 15 |
| n74 | E-UTRA Band 1, 2, 3, 4, 5, 7, 8, 12, 13, 17, 18, 19, 20, 26, 28, 29, 31, 34, 38, 39, 40, 41, 42, 43, 48, 52, 65, 66, 67, 68, 85  NR Band n77, n78, n100, n101 | FDL\_low | - | FDL\_high | -50 | 1 |  |
|  | NR Band n79 | FDL\_low | - | FDL\_high | -50 | 1 | 2 |
|  | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8 |
|  | Frequency range | 1400 | - | 1427 | -32 | 27 | 15, 41 |
|  | Frequency range | 1475 | - | 1488 | -28 | 1 | 15, 42 |
|  | Frequency range | 1475 | - | 1488 | -50 | 1 | 15, 45 |
|  | Frequency range | 1475.9 | - | 1510.9 | -35 | 1 | 15, 46 |
|  | Frequency range | 1488 | - | 1518 | -50 | 1 | 15 |
| n77 | E-UTRA Band 1, 2, 3, 4, 5, 7, 8, 11, 12, 13, 14, 17, 18, 19, 20, 21, 24, 25, 26, 27, 28, 29, 30, 34, 39, 40, 41, 53, 54, 65, 66, 70, 71, 74, 85, 103  NR Band n100, n101 | FDL\_low | - | FDL\_high | -50 | 1 |  |
|  | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8 |
| n78 | E-UTRA Band 1, 2, 3, 5, 7, 8, 11, 18, 19, 20, 21, 25, 26, 28, 32, 34, 38, 39, 40, 41, 50, 65, 66, 67, 70, 71, 74, 75, 76  NR Band n100, n101 | FDL\_low | - | FDL\_high | -50 | 1 |  |
|  | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8 |
| n79 | E-UTRA Band 1, 3, 5, 7, 8, 11, 18, 19, 21, 28, 34, 39, 40, 41, 42, 65, 74 | FDL\_low | - | FDL\_high | -50 | 1 |  |
|  | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8 |
| n85 | E-UTRA Band 2, 5, 13, 14, 17, 24, 25, 26, 27, 30, 41, 53, 54, 70, 71, 74, 103 | FDL\_low | - | FDL\_high | -50 | 1 |  |
|  | E-UTRA Band 4, 48, 50, 51, 66  NR Band n77, n78 | FDL\_low | - | FDL\_high | -50 | 1 | 2 |
|  | E-UTRA Band 12, 85 | FDL\_low | - | FDL\_high | -50 | 1 | 15 |
| n95 | E-UTRA Band 1, 3 , 5, 8, 28, 39, 40, 41  NR Band n78, n79 | FDL\_low | - | FDL\_high | -50 | 1 | 5 |
|  | NR Band n77 | FDL\_low | - | FDL\_high | -50 | 1 | 2 |
|  | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8 |
| n100 | E-UTRA Band 1, 3, 8, 20, 28, 31, 32, 33, 34, 38, 40, 43, 50, 51, 52, 65, 67, 68, 69, 72, 74, 75, 76  NR Band n101 | FDL\_low | - | FDL\_high | -50 | 1 |  |
| E-UTRA Band 7, 22, 42  NR Band n77, n78 | FDL\_low | - | FDL\_high | -50 | 1 | 2 |
| Frequency range | 758 | - | 788 | -50 | 1 |  |
| n101 | E-UTRA Band 1, 3, 8, 20, 22,  28, 31, 32, 38, 40,  50, 51, 52, 65, 67, 68, 69, 72,  74, 75, 76  NR Band n100 | FDL\_low | - | FDL\_high | -50 | 1 |  |
|  | E-UTRA Band 7, 42, 43  NR Band n77, n78 | FDL\_low | - | FDL\_high | -50 | 1 | 2 |
|  | Frequency range | 758 | - | 788 | -50 | 1 |  |
| NOTE 1: FDL\_low and FDL\_high refer to each frequency band specified in Table 5.2-1 in TS 38.101-1 [2] or Table 5.5-1 in TS 36.101  NOTE 2: As exceptions, measurements with a level up to the applicable requirements defined in Table 6.5.3.1-2 are permitted for each assigned NR carrier used in the measurement due to 2nd, 3rd, 4th or 5th harmonic spurious emissions. Due to spreading of the harmonic emission the exception is also allowed for the first 1 MHz frequency range immediately outside the harmonic emission on both sides of the harmonic emission. This results in an overall exception interval centred at the harmonic emission of (2 MHz + N x LCRB x RBsize kHz), where N is 2, 3, 4, 5 for the 2nd, 3rd, 4th or 5th harmonic respectively. The exception is allowed if the measurement bandwidth (MBW) totally or partially overlaps the overall exception interval.  NOTE 3: 15 kHz SCS is assumed when RB is mentioned in the note when channel bandwidth is less than or equal to 50 MHz, lowest SCS is assumed when channel bandwidth is larger than 50 MHz. The transmission bandwidth in terms of RB position and range is not limited to 15 kHz SCS and shall scale with SCS accordingly.  NOTE 4: Void  NOTE 5: For non-synchronised TDD operation to meet these requirements some restriction will be needed for either the operating band or protected band  NOTE 6: N/A  NOTE 7: Void  NOTE 8: Applicable when co-existence with PHS system operating in 1884.5 - 1915.7 MHz.  NOTE 9: Void  NOTE 10: Void  NOTE 11: Void  NOTE 12: The emissions measurement shall be sufficiently power averaged to ensure a standard deviation < 0.5 dB  NOTE 13: Void  NOTE 14: Void  NOTE 15: These requirements also apply for the frequency ranges that are less than FOOB (MHz) in Table 6.5.3.1-1 from the edge of the channel bandwidth.  NOTE 16: Void  NOTE 17: Void  NOTE 18: Void  NOTE 19: Applicable when the assigned NR carrier is confined within 718 MHz and 748 MHz and when the channel bandwidth used is 5 or 10 MHz.  NOTE 20: Void  NOTE 21: This requirement is applicable for any channel bandwidths up to 20MHz within the range 2500 - 2570 MHz with the following restriction: for carriers of 15 MHz bandwidth when carrier centre frequency is within the range 2560.5 - 2562.5 MHz and for carriers of 20 MHz bandwidth when carrier centre frequency is within the range 2552 - 2560 MHz the requirement is applicable only for an uplink transmission bandwidth less than or equal to 54 RB.  NOTE 22: This requirement is applicable for power class 3 UE for any channel bandwidths up to 20 MHz. For channel bandwidth within the range 2570 - 2615 MHz with the following restriction: for carriers of 15 MHz bandwidth when the carrier centre frequency is within the range 2605.5 - 2607.5 MHz and for carriers of 20 MHz bandwidth when the carrier centre frequency is within the range 2597 - 2605 MHz the requirement is applicable only for an uplink transmission bandwidth less than or equal to 54 RB. For carriers overlapping the frequency range 2615 - 2620 MHz the requirement applies with the maximum output power configured to +19 dBm in the IE P-Max.  NOTE 23: Void  NOTE 24: As exceptions, measurements with a level up to the applicable requirement of -38 dBm/MHz is permitted for each assigned NR carrier used in the measurement due to 2nd harmonic spurious emissions. An exception is allowed if there is at least one individual RB within the transmission bandwidth (see Figure 5.3.1-1) for which the 2nd harmonic totally or partially overlaps the measurement bandwidth (MBW).  NOTE 25: As exceptions, measurements with a level up to the applicable requirement of -36 dBm/MHz is permitted for each assigned NR carrier used in the measurement due to 3rd harmonic spurious emissions. An exception is allowed if there is at least one individual RB within the transmission bandwidth (see Figure 5.3.1-1) for which the 3rd harmonic totally or partially overlaps the measurement bandwidth (MBW).  NOTE 26: For these adjacent bands, the emission limit could imply risk of harmful interference to UE(s) operating in the protected operating band.  NOTE 27: This requirement is applicable for channel bandwidths up to 20 MHz within the range 1920 - 1980 MHz with the following restriction: for carriers of 15 MHz bandwidth when the carrier centre frequency is within the range 1927.5 - 1929.5 MHz and for carriers of 20 MHz bandwidth when the carrier centre frequency is within the range 1930 - 1938 MHz the requirement is applicable only for an uplink transmission bandwidth less than or equal to 54 RB.  NOTE 28: Void  NOTE 29: Void  NOTE 30: Void  NOTE 31: Void  NOTE 32: Void  NOTE 33: This requirement is only applicable for carriers with bandwidth up to 20MHz and confined within 1885-1920 MHz (requirement for carriers with at least 1RB confined within 1880 - 1885 MHz is not specified). This requirement applies for an uplink transmission bandwidth less than or equal to 54 RB for carriers of 15 MHz bandwidth when carrier center frequency is within the range 1892.5 - 1894.5 MHz and for carriers of 20 MHz bandwidth when carrier center frequency is within the range 1895 - 1903 MHz. The above restriction is applicable to only power class 3 UEs.  NOTE 34: This requirement is applicable for 5 and 10 MHz NR channel bandwidth allocated within 718-728 MHz. For carriers of 10 MHz bandwidth, this requirement applies for an uplink transmission bandwidth less than or equal to 30 RB with RBstart > 1 and RBstart < 48.  NOTE 35: This requirement is applicable in the case of a 10 MHz NR carrier confined within 703 MHz and 733 MHz, otherwise the requirement of -25 dBm with a measurement bandwidth of 8 MHz applies.  NOTE 36: Void  NOTE 37: Void  NOTE 38: Void  NOTE 39: Void  NOTE 40: Void  NOTE 41: Applicable for cases and when the lower edge of the assigned NR UL channel bandwidth frequency is greater than or equal to 1427 MHz + the channel BW assigned for 5 and 10 MHz bandwidth, and when the lower edge of the assigned NR UL channel bandwidth frequency is greater than or equal to 1440 MHz for 15 and 20 MHz bandwidth. This requirement shall be verified with UE transmission power configured as high as possible but no higher than 15 dBm.  NOTE 42: Applicable when upper edge of the assigned NR UL channel bandwidth frequency is more than 1460 MHz and less than or equal to 1470 MHz for 5 MHz bandwidth, and when the upper edge of the assigned NR UL channel bandwidth frequency is more than 1460 MHz and less than or equal to 1465 MHz for 10 MHz bandwidth.  NOTE 43: TThis requirement is applicable for UE which is operating in power class 3 and NR channel bandwidths up to 20 MHz within frequency range 1920-1980 MHz.  NOTE 44: As exceptions, for 90 and 100 MHz channel bandwidth, -40 dBm/MHz is applicable in the frequency range of 2496 – 2505 MHz.  NOTE 45: Applicable when upper edge of the assigned NR UL channel bandwidth frequency is equal to or less than 1460 MHz.  NOTE 46: Applicable for 5 MHz bandwidth and when the NR carrier is within 1447.9 – 1462.9 MHz. | | | | | | | |

NOTE: To simplify Table 6.5.3.2.3-2 and 6.5.3.2.3-4, E-UTRA band numbers are listed for bands which are specified only for E-UTRA operation or both E-UTRA and NR operation. NR band numbers are listed for bands which are specified only for NR operation.

The normative reference for this requirement is TS 38.101-1 [2] subclause 6.5.3.2. This test use minimum requirements from many releases of TS 38.101-1 [2] due to release independence defined in TS 38.307 [23].

6.5.3.2.4 Test description

6.5.3.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, test channel bandwidths and sub-carrier spacing based on NR operating bands specified in Table 5.3.5-1. All of these configurations shall be tested with applicable test parameters for each combination of channel bandwidth and sub-carrier spacing, are shown in Table 6.5.3.2.4.1-1. The details of the uplink reference measurement channels (RMCs) are specified in Annexes A.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Table 6.5.3.2.4.1-1: Test Configuration Table

|  |  |  |  |
| --- | --- | --- | --- |
| Initial Conditions | | | |
| Test Environment as specified in TS 38.508-1 [5] subclause 4.1. | | Normal | |
| Test Frequencies as specified in TS 38.508-1 [5] subclause 4.3.1. | | Low range, Mid range, High range (NOTE 2) | |
| Test Channel Bandwidths as specified in TS 38.508-1 [5] subclause 4.3.1. | | Lowest, Mid, Highest | |
| Test SCS as specified in Table 5.3.5-1 | | Lowest | |
| Test Parameters | | | |
| Test ID | Downlink Configuration | Uplink Configuration | |
|  | N/A | Modulation | RB allocation (NOTE 1) |
| 1 |  | CP-OFDM QPSK | Outer\_Full |
| 2 |  | CP-OFDM QPSK | Edge\_1RB\_Left |
| 3 |  | CP-OFDM QPSK | Edge\_1RB\_Right |
| NOTE 1: The specific configuration of each RB allocation is defined in Table 6.1-1 Common UL configuration.  NOTE 2: For NR band n28, 30MHz test channel bandwidth is tested with Low range and High range test frequencies. | | | |

1. Connect the SS to the UE antenna connectors as shown in TS 38.508-1 [5] Annex A, Figure A.3.1.1.1 for TE diagram and section A.3.2 for UE diagram.

2. The parameter settings for the cell are set up according to TS 38.508-1 [5] subclause 4.4.3.

3. Downlink signals are initially set up according to Annex C.0, C.1, C.2, and uplink signals according to Annex G.0, G.1, G.2, G.3.0.

4. The UL Reference Measurement channels are set according to Table 6.5.3.2.4.1-1.

5. Propagation conditions are set according to Annex B.0.

6. Ensure the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On,* Test Mode *On* and Test Loop Function *On* according to TS 38.508-1 [5] clause 4.5. Message contents are defined in clause 6.5.3.2.4.3.

6.5.3.2.4.2 Test procedure

1 SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0\_1 for C\_RNTI to schedule the UL RMC according to Table 6.5.3.2.4.1-1. Since the UE has no payload data to send, the UE transmits uplink MAC padding bits on the UL RMC.

2. Send continuously uplink power control "up" commands in the uplink scheduling information to the UE until the UE transmits at PUMAX level.

3. Measure the power of the transmitted signal with a measurement filter of bandwidths according to Tables 6.5.3.2.3-1 to 6.5.3.2.3-3. The centre frequency of the filter shall be stepped in contiguous steps according to Tables 6.5.3.2.3-1 to 6.5.3.2.3-3. The measured power shall be verified for each step. The measurement period shall capture the active time slots. During measurement the spectrum analyser shall be set to 'Detector' = RMS. If the sweep count is higher than one, the trace mode shall be average.

6.5.3.2.4.3 Message contents

Message contents are according to TS 38.508-1 [5] subclause 4.6.

6.5.3.2.5 Test requirement

Test requirements for Spurious Emissions UE Co-existence are the same as the minimum requirements and are not repeated in this section.

Unless otherwise stated, the spurious emission limits apply for the frequency ranges that are more than FOOB (MHz) in Tables 6.5.3.1.3-1 from the edge of the channel bandwidth. The spurious emission limits in Tables 6.5.3.2.3-1 to 6.5.3.2.3-4 apply for all transmitter band configurations (NRB) and channel bandwidths.

The measured average power of spurious emission, derived in step 3, shall not exceed the described value in Table 6.5.3.2.3-1 to 6.5.3.2.3-4 for difference releases.

The requirements for the UE are release specific and can be found in Tables 6.5.3.2.3-1 to 6.5.3.2.3-4. If the UE support a band, which is not defined in the table corresponding UE’s release, the requirements for this band are taken from the table of earliest release where requirements for this band are defined. This has been described in following Table 6.5.3.2.5-1.

Table 6.5.3.2.5-1: UE Requirements according to UE NR release and supported E-UTRA and NR band

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| UE Requirements per release | | | | |
| NR Band | Rel-15 | Rel-16 | Rel-17 | Rel-18 |
| n1 | Table 6.5.3.2.3-1 | Table 6.5.3.2.3-2 | Table 6.5.3.2.3-3 | Table 6.5.3.2.3-4 |
| n2 | Table 6.5.3.2.3-1 | Table 6.5.3.2.3-2 | Table 6.5.3.2.3-3 | Table 6.5.3.2.3-4 |
| n3 | Table 6.5.3.2.3-1 | Table 6.5.3.2.3-2 | Table 6.5.3.2.3-3 | Table 6.5.3.2.3-4 |
| n5 | Table 6.5.3.2.3-1 | Table 6.5.3.2.3-2 | Table 6.5.3.2.3-3 | Table 6.5.3.2.3-4 |
| n7 | Table 6.5.3.2.3-1 | Table 6.5.3.2.3-2 | Table 6.5.3.2.3-3 | Table 6.5.3.2.3-4 |
| n8 | Table 6.5.3.2.3-1 | Table 6.5.3.2.3-2 | Table 6.5.3.2.3-3 | Table 6.5.3.2.3-4 |
| n12 | Table 6.5.3.2.3-1 | Table 6.5.3.2.3-2 | Table 6.5.3.2.3-3 | Table 6.5.3.2.3-4 |
| n13 | Table 6.5.3.2.3-3 | Table 6.5.3.2.3-3 | Table 6.5.3.2.3-3 | Table 6.5.3.2.3-4 |
| n14 | Table 6.5.3.2.3-2 | Table 6.5.3.2.3-2 | Table 6.5.3.2.3-3 | Table 6.5.3.2.3-4 |
| n18 | Table 6.5.3.2.3-2 | Table 6.5.3.2.3-2 | Table 6.5.3.2.3-3 | Table 6.5.3.2.3-4 |
| n20 | Table 6.5.3.2.3-1 | Table 6.5.3.2.3-2 | Table 6.5.3.2.3-3 | Table 6.5.3.2.3-4 |
| n24 | Table 6.5.3.2.3-3 | Table 6.5.3.2.3-3 | Table 6.5.3.2.3-3 | Table 6.5.3.2.3-4 |
| n25 | Table 6.5.3.2.3-1 | Table 6.5.3.2.3-2 | Table 6.5.3.2.3-3 | Table 6.5.3.2.3-4 |
| n26 | Table 6.5.3.2.3-2 | Table 6.5.3.2.3-2 | Table 6.5.3.2.3-3 | Table 6.5.3.2.3-4 |
| n28 | Table 6.5.3.2.3-1 | Table 6.5.3.2.3-2 | Table 6.5.3.2.3-3 | Table 6.5.3.2.3-4 |
| n30 | Table 6.5.3.2.3-2 | Table 6.5.3.2.3-2 | Table 6.5.3.2.3-3 | Table 6.5.3.2.3-4 |
| n34 | Table 6.5.3.2.3-1 | Table 6.5.3.2.3-2 | Table 6.5.3.2.3-3 | Table 6.5.3.2.3-4 |
| n38 | Table 6.5.3.2.3-1 | Table 6.5.3.2.3-2 | Table 6.5.3.2.3-3 | Table 6.5.3.2.3-4 |
| n39 | Table 6.5.3.2.3-1 | Table 6.5.3.2.3-2 | Table 6.5.3.2.3-3 | Table 6.5.3.2.3-4 |
| n40 | Table 6.5.3.2.3-1 | Table 6.5.3.2.3-2 | Table 6.5.3.2.3-3 | Table 6.5.3.2.3-4 |
| n41 | Table 6.5.3.2.3-1 | Table 6.5.3.2.3-2 | Table 6.5.3.2.3-3 | Table 6.5.3.2.3-4 |
| n48 | Table 6.5.3.2.3-2 | Table 6.5.3.2.3-2 | Table 6.5.3.2.3-3 | Table 6.5.3.2.3-4 |
| n50 | Table 6.5.3.2.3-1 | Table 6.5.3.2.3-2 | Table 6.5.3.2.3-3 | Table 6.5.3.2.3-4 |
| n51 | Table 6.5.3.2.3-1 | Table 6.5.3.2.3-2 | Table 6.5.3.2.3-3 | Table 6.5.3.2.3-4 |
| n53 | Table 6.5.3.2.3-2 | Table 6.5.3.2.3-2 | Table 6.5.3.2.3-3 | Table 6.5.3.2.3-4 |
| n65 | Table 6.5.3.2.3-2 | Table 6.5.3.2.3-2 | Table 6.5.3.2.3-3 | Table 6.5.3.2.3-4 |
| n66 | Table 6.5.3.2.3-1 | Table 6.5.3.2.3-2 | Table 6.5.3.2.3-3 | Table 6.5.3.2.3-4 |
| n70 | Table 6.5.3.2.3-1 | Table 6.5.3.2.3-2 | Table 6.5.3.2.3-3 | Table 6.5.3.2.3-4 |
| n71 | Table 6.5.3.2.3-1 | Table 6.5.3.2.3-2 | Table 6.5.3.2.3-3 | Table 6.5.3.2.3-4 |
| n74 | Table 6.5.3.2.3-1 | Table 6.5.3.2.3-2 | Table 6.5.3.2.3-3 | Table 6.5.3.2.3-4 |
| n77, n78 | Table 6.5.3.2.3-1 | Table 6.5.3.2.3-2 | Table 6.5.3.2.3-3 | Table 6.5.3.2.3-4 |
| n79 | Table 6.5.3.2.3-1 | Table 6.5.3.2.3-2 | Table 6.5.3.2.3-3 | Table 6.5.3.2.3-4 |
| n91 | Table 6.5.3.2.3-2 | Table 6.5.3.2.3-2 | Table 6.5.3.2.3-3 | Table 6.5.3.2.3-4 |
| n92 | Table 6.5.3.2.3-2 | Table 6.5.3.2.3-2 | Table 6.5.3.2.3-3 | Table 6.5.3.2.3-4 |
| n93 | Table 6.5.3.2.3-2 | Table 6.5.3.2.3-2 | Table 6.5.3.2.3-3 | Table 6.5.3.2.3-4 |
| n94 | Table 6.5.3.2.3-2 | Table 6.5.3.2.3-2 | Table 6.5.3.2.3-3 | Table 6.5.3.2.3-4 |
| n100 | Table 6.5.3.2.3-3 | Table 6.5.3.2.3-3 | Table 6.5.3.2.3-3 | Table 6.5.3.2.3-4 |
| n101 | Table 6.5.3.2.3-3 | Table 6.5.3.2.3-3 | Table 6.5.3.2.3-3 | Table 6.5.3.2.3-4 |
| NOTE 1: The frequency range applicable with network signalling values of NS\_04, NS\_17, NS\_18, NS\_05, NS\_43, NS\_37, NS\_38, NS\_39, NS\_40, NS\_41, NS\_42, NS\_45 and NS\_56 are covered in subclause 6.5.3.3 Additional Spurious Emissions  NOTE 2: The restriction on the maximum uplink transmission to 54 RB in Notes 21 and 22 of Tables 6.5.3.2.3-1 to 6.5.3.2.3-3 is intended for conformance testing and may be applied to network operation to facilitate coexistence when the aggressor and victim bands are deployed in the same geographical area. The applicable spurious emission requirement of -15.5 dBm/5MHz is a least restrictive technical condition for FDD/TDD coexistence and may have to be revised in the future. | | | | |

#### 6.5.3.3 Additional spurious emissions

Editor’s note: This clause is incomplete. The following aspects are either missing or not yet determined.

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Test requirement for NS\_38, NS\_39, NS\_40 are incomplete.

The requirements of this test case for NS\_44, NS\_46, NS\_47, NS\_48, and NS\_49 apply to all types of NR UE release 16 forward, and release 15 if the corresponding channel bandwidths are supported.

Clarification from RAN4 is needed for NOTE 1 in Table 6.5.3.3.3.10-1 of 38.101-1 as a UE's output power may not be able to reach 15dBm.

6.5.3.3.1 Test purpose

To verify that UE transmitter does not cause unacceptable interference to other channels or other systems in terms of transmitter spurious emissions under the deployment scenarios where additional requirements are specified.

6.5.3.3.2 Test applicability

This test case applies for network signalling values NS\_04, NS\_05, NS\_05U, NS\_07, NS\_12, NS\_13, NS\_14, NS\_15, NS\_17, NS\_18, NS\_21, NS\_24, NS\_27, NS\_37, NS\_38, NS\_39, NS\_40, NS\_41, NS\_42, NS\_43, NS\_43U, NS\_44, NS\_45, NS\_47, NS\_48, NS\_49, NS\_50 and NS\_56 to all types of NR Power Class 2 and Power Class 3 UE release 15 and forward that don’t support Tx diversity.

6.5.3.3.3 Minimum conformance requirements

These requirements are specified in terms of an additional spectrum emission requirement. Additional spurious emission requirements are signalled by the network to indicate that the UE shall meet an additional requirement for a specific deployment scenario as part of the cell handover/broadcast message.

6.5.3.3.3.1 Minimum conformance requirements (network signalling value "NS\_04")

When "NS 04" is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 6.5.3.3.3.1-1. This requirement also applies for the frequency ranges that are less than FOOB (MHz) in Table 6.5.3.1.3-1 from the edge of the channel bandwidth.

Table 6.5.3.3.3.1-1: Additional requirements for “NS\_04”

|  |  |  |
| --- | --- | --- |
| Frequency band  (MHz) | Channel bandwidth (MHz) / Spectrum emission limit (dBm) | Measurement bandwidth |
| 10, 15, 20, 30, 40, 50, 60, 70, 80, 90, 100 |
| 2495 ≤ f < 2496 | -13 | 1% of Channel BW |
| 2490.5 ≤ f < 2495 | -13 | 1 MHz |
| 0.009 < f < 2490.5 | -25 | 1 MHz |

The normative reference for this requirement is TS 38.101-1 [2] subclause 6.5.3.3.1.

6.5.3.3.3.2 Minimum conformance requirements (network signalling value "NS\_17")

When “NS\_17” is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 6.5.3.3.3.2-1. This requirement also applies for the frequency ranges that are less than FOOB (MHz) in Table 6.5.3.1.3-1 from the edge of the channel bandwidth.

Table 6.5.3.3.3.2-1: Additional requirements for “NS\_17”

|  |  |  |  |
| --- | --- | --- | --- |
| Frequency band  (MHz) | Channel bandwidth (MHz)/ Spectrum emission limit (dBm) | Measurement bandwidth | NOTE |
| 5, 10 |
| 470 ≤ f ≤ 710 | -26.2 | 6 MHz | 1 |
| NOTE 1: Applicable when the assigned NR carrier is confined within 718 MHz and 748 MHz and when the channel bandwidth is 5 or 10 MHz. | | | |

The normative reference for this requirement is TS 38.101-1 [2] subclause 6.5.3.3.2.

6.5.3.3.3.3 Minimum conformance requirements (network signalling value "NS\_18")

When “NS\_18” is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 6.5.3.3.3.3-1. This requirement also applies for the frequency ranges that are less than FOOB (MHz) in Table 6.5.3.1.3-1 from the edge of the channel bandwidth.

Table 6.5.3.3.3.3-1: Additional requirements for “NS\_18”

|  |  |  |  |
| --- | --- | --- | --- |
| Frequency band  (MHz) | Channel bandwidth (MHz)/ Spectrum emission limit (dBm) | Measurement bandwidth |  |
| 5, 10, 15, 20, 30 |
| 692-698 | -26.2 | 6 MHz |  |

The normative reference for this requirement is TS 38.101-1 [2] subclause 6.5.3.3.3.

6.5.3.3.3.4 Minimum conformance requirements (network signalling value "NS\_05" and "NS\_05U")

When “NS\_05” is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 6.5.3.3.3.4-1. This requirement also applies for the frequency ranges that are less than FOOB (MHz) in Table 6.5.3.1.3-1 from the edge of the channel bandwidth.

Table 6.5.3.3.3.4-1: Additional requirements for "NS\_05" and "NS\_05U"

|  |  |  |  |
| --- | --- | --- | --- |
| Frequency band  (MHz) | Channel bandwidth (MHz) / Spectrum emission limit (dBm) | Measurement bandwidth | NOTE |
| 5, 10, 15, 20 |
| 1884.5 f 1915.7 | -41 | 300 kHz |  |

The normative reference for this requirement is TS 38.101-1 [2] subclause 6.5.3.3.4.

6.5.3.3.3.5 Minimum conformance requirements (network signalling value "NS\_43" and "NS\_43U")

When “NS\_43” is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 6.5.3.3.3.5-1. This requirement also applies for the frequency ranges that are less than FOOB (MHz) in Table 6.5.3.1.3-1 from the edge of the channel bandwidth.

Table 6.5.3.3.3.5-1: Additional requirement for "NS\_43" and "NS\_43U"

|  |  |  |
| --- | --- | --- |
| Frequency band  (MHz) | Channel bandwidth (MHz) / Spectrum emission limit (dBm) | Measurement bandwidth |
| 5, 10, 15 |
| 860 ≤ f ≤ 890 | -40 | 1 MHz |
| NOTE 1: Applicable for 5 MHz and 15 MHz channel BW confined between 900 MHz and 915 MHz and for 10 MHz channel BW confined between 905 MHz and 915 MHz | | |

The normative reference for this requirement is TS 38.101-1 [2] subclause 6.5.3.3.5.

6.5.3.3.3.6 Minimum conformance requirements (network signalling value "NS\_37")

When “NS 37” is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 6.5.3.3.6-1. This requirement also applies for the frequency ranges that are less than FOOB (MHz) in Table 6.5.3.1.3-1 from the edge of the channel bandwidth.

Table 6.5.3.3.6-1: Additional requirement for “NS\_37”

|  |  |  |
| --- | --- | --- |
| Frequency band  (MHz) | Channel bandwidth (MHz) / Spectrum emission limit (dBm) | Measurement bandwidth |
| 5, 10, 15, 20 |
| 1475.9 ≤ f ≤ 1510.9 | -35 | 1 MHz |

The normative reference for this requirement is TS 38.101-1 [2] subclause 6.5.3.3.6.

6.5.3.3.3.7 Minimum conformance requirements (network signalling value "NS\_38")

When “NS 38” is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 6.5.3.3.7-1. This requirement also applies for the frequency ranges that are less than FOOB (MHz) in Table 6.5.3.1.3-1 from the edge of the channel bandwidth.

Table 6.5.3.3.7-1: Additional requirements for “NS\_38”

|  |  |  |
| --- | --- | --- |
| Frequency band  (MHz) | Channel bandwidth (MHz) / Spectrum emission limit  (dBm) | Measurement bandwidth |
| 5, 10, 15, 20 |
| 1400 ≤ f ≤ 1427 | -32 | 27 MHz |
| NOTE 1: This requirement shall be verified with UE transmission power of 15 dBm. | | |

The normative reference for this requirement is TS 38.101-1 [2] subclause 6.5.3.3.7.

6.5.3.3.3.8 Minimum conformance requirements (network signalling value "NS\_39")

When “NS 39” is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 6.5.3.3.8-1. This requirement also applies for the frequency ranges that are less than FOOB (MHz) in Table 6.5.3.1.3-1 from the edge of the channel bandwidth.

Table 6.5.3.3.8-1: Additional requirements for "NS\_39"

|  |  |  |
| --- | --- | --- |
| Frequency band  (MHz) | Channel bandwidth (MHz) /  Spectrum emission limit  (dBm) | Measurement bandwidth |
| 5, 10, 15, 20 |
| 1475 ≤ f ≤ 1488 | -28 | 1MHz |

The normative reference for this requirement is TS 38.101-1 [2] subclause 6.5.3.3.8.

6.5.3.3.3.9 Minimum conformance requirements (network signalling value "NS\_40")

When "NS\_40" is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 6.5.3.3.3.9-1. This requirement also applies for the frequency ranges that are less than FOOB (MHz) in Table 6.5.3.1.3-1 from the edge of the channel bandwidth.

Table 6.5.3.3.3.9-1: Additional requirements for NR channels assigned within 1427-1452MHz for "NS\_40"

|  |  |  |
| --- | --- | --- |
| Frequency band  (MHz) | Channel bandwidth (MHz) /  Spectrum emission limit  (dBm) | Measurement bandwidth |
| 5 |
| 1400 ≤ f ≤ 1427 | -32 | 27 MHz |
| NOTE 1: This requirement shall be verified with UE transmission power of 15 dBm. | | |

The normative reference for this requirement is TS 38.101-1 [2] subclause 6.5.3.3.9.

6.5.3.3.3.10 Minimum conformance requirements (network signalling value “NS\_41”)

When "NS\_41" is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 6.5.3.3.3.10-1. This requirement also applies for the frequency ranges that are less than FOOB (MHz) in Table 6.5.3.1.3-1 from the edge of the channel bandwidth.

Table 6.5.3.3.3.10-1: Additional requirements for NR channels assigned within 1432-1517 MHz for "NS\_41"

|  |  |  |
| --- | --- | --- |
| Frequency band  (MHz) | Channel bandwidth (MHz) /  Spectrum emission limit  (dBm) | Measurement bandwidth |
| 5, 10, 15, 20, 40, 50, 60 |
| 1400 ≤ f ≤ 1427 | -32 | 27 MHz |
| NOTE 1: This requirement shall be verified with UE transmission power of 15 dBm. | | |

The normative reference for this requirement is TS 38.101-1 [2] subclause 6.5.3.3.10.

6.5.3.3.3.11 Minimum conformance requirements (network signalling value "NS\_42")

When "NS\_42" is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 6.5.3.3.3.11-1. This requirement also applies for the frequency ranges that are less than FOOB (MHz) in Table 6.5.3.1.3-1 from the edge of the channel bandwidth.

Table 6.5.3.3.3.11-1: Additional requirements for NR channels assigned within 1432-1517MHz for "NS\_42"

|  |  |  |
| --- | --- | --- |
| Frequency band  (MHz) | Channel bandwidth (MHz) /  Spectrum emission limit  (dBm) | Measurement bandwidth |
| 5, 10, 15, 20, 40, 50, 60 |
| 1518 ≤ f ≤ 1520 | -0.8 | 1 MHz |
| 1520 < f ≤ 1559 | -30 | 1 MHz |

The normative reference for this requirement is TS 38.101-1 [2] subclause 6.5.3.3.11.

6.5.3.3.3.12 Minimum conformance requirements (network signalling value "NS\_21")

When "NS\_21" is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 6.5.3.3.3.12-1. These requirements also apply for the frequency ranges that are less than FOOB (MHz) in Table 6.5.3.1.3-1 from the edge of the channel bandwidth.

Table 6.5.3.3.3.12-1: Additional requirements for "NS\_21"

|  |  |  |
| --- | --- | --- |
| Frequency band  (MHz) | Channel bandwidth (MHz) / Spectrum emission limit (dBm) | Measurement bandwidth |
| 5, 10 |
| 2200 ≤ f < 2288 | -40 | 1 MHz |
| 2288 ≤ f < 2292 | -37 | 1 MHz |
| 2292 ≤ f < 2296 | -31 | 1 MHz |
| 2296 ≤ f < 2300 | -25 | 1 MHz |
| 2320 ≤ f < 2324 | -25 | 1 MHz |
| 2324 ≤ f < 2328 | -31 | 1 MHz |
| 2328 ≤ f < 2332 | -37 | 1 MHz |
| 2332 ≤ f ≤ 2395 | -40 | 1 MHz |

The normative reference for this requirement is TS 38.101-1 [2] subclause 6.5.3.3.12.

6.5.3.3.3.13 Minimum conformance requirements (network signalling value "NS\_24")

When "NS 24" is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 6.5.3.3.3.13-1. This requirement also applies for the frequency ranges that are less than FOOB (MHz) in Table 6.5.3.1.3-1 from the edge of the channel bandwidth.

Table 6.5.3.3.3.13-1: Additional requirements

|  |  |  |
| --- | --- | --- |
| Frequency band  (MHz) | Channel bandwidth (MHz) /  Spectrum emission limit  (dBm) | Measurement bandwidth |
| 5, 10, 15, 20 |
| 2010 ≤ f ≤ 2025 | -50 | 1 MHz |
| NOTE 1:This requirement applies at a frequency offset equal or larger than 5 MHz from the upper edge of the channel bandwidth, whenever these frequencies overlap with the specified frequency band. | | |

The normative reference for this requirement is TS 38.101-1 [2] subclause 6.5.3.3.13.

6.5.3.3.3.14 Minimum conformance requirements (network signalling value "NS\_27")

When "NS 27" is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 6.5.3.3.3.14-1. This requirement also applies for the frequency ranges that are less than FOOB (MHz) in Table 6.5.3.1.3-1 from the edge of the channel bandwidth.

Table 6.5.3.3.14-1: Additional requirements for "NS\_27"

|  |  |  |
| --- | --- | --- |
| Frequency range  (MHz) | Channel bandwidth (MHz) / Spectrum emission limit (dBm) | Measurement bandwidth |
| 5, 10, 15, 20, 30, 40 |
| 9 kHz – 3530 MHz | -40 | 1 MHz |
| 3530 MHz – 3540 MHz | -25 |
| 3710 MHz – 3720 MHz | -25 |
| 3720 MHz – 12.75 GHz | -40 |

The normative reference for this requirement is TS 38.101-1 [2] subclause 6.5.3.3.14.

6.5.3.3.3.15 Minimum conformance requirements (network signalling value "NS\_47")

When "NS\_47" is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 6.5.3.3.3.15-1. This requirement also applies for the frequency ranges that are less than FOOB (MHz) in Table 6.5.3.1.3-1 from the edge of the channel bandwidth.

Table 6.5.3.3.3.15-1: Additional requirements for NR channels assigned within 2545 - 2575 MHz for "NS\_47"

|  |  |  |
| --- | --- | --- |
| Frequency band  (MHz) | Channel bandwidth (MHz) /  Spectrum emission limit  (dBm) | Measurement bandwidth |
| 30 |
| 2530 ≤ f ≤ 2535 | -25 | 1 MHz |
| 2505 ≤ f ≤ 2530 | -30 | 1 MHz |

The normative reference for this requirement is TS 38.101-1 [2] subclause 6.5.3.3.15.

6.5.3.3.3.16 Minimum conformance requirements (network signalling value "NS\_50")

When "NS\_50" is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 6.5.3.3.3.16-1. This requirement also applies for the frequency ranges that are less than FOOB (MHz) in Table 6.5.3.1.3-1 from the edge of the channel bandwidth.

Table 6.5.3.3.3.16-1: Additional requirements for “NS\_50”

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Protected band | Frequency range (MHz) | | | Maximum Level (dBm) | MBW (MHz) | NOTE |
| Frequency range | 1805 | - | 1855 | -40 | 1 | 1 |
| Frequency range | 1855 | - | 1880 | -15.5 | 5 | 1, 2, 3 |
| NOTE 1: This requirement is applicable for carriers with aggregated channel bandwidths confined in 1885-1920 MHz for ≤ 30MHz channel BWs and confined in 1880-1920 MHz for 40MHz channel BW.  NOTE 2: The requirement also applies for the frequency ranges that are less than FOOB (MHz) in Table 6.5.3.1.3-1 and Table 6.5A.3.1.0-1 from the edge of the channel bandwidth.  NOTE 3: For these adjacent bands, the emission limit could imply risk of harmful interference to UE(s) operating in the protected operating band. | | | | | | |

The normative reference for this requirement is TS 38.101-1 [2] subclause 6.5.3.3.16.

6.5.3.3.3.17 Minimum conformance requirements (network signalling value "NS\_12")

When "NS\_12" is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 6.5.3.3.3.17-1. This requirement also applies for the frequency ranges that are less than FOOB (MHz) in Table 6.5.3.1.3-1 from the edge of the channel bandwidth.

Table 6.5.3.3.3.17-1: Additional requirements for “NS\_12”

|  |  |  |
| --- | --- | --- |
| Frequency band  (MHz) | Channel bandwidth /  Spectrum emission limit  (dBm) | Measurement bandwidth |
| 5 MHz, 10 MHz |
| 806 ≤ f ≤ 813.5 | -42 | 6.25 kHz |
| NOTE 1: The requirement applies for NR carriers with lower channel edge at or above 814 MHz.  NOTE 2: The emissions measurement shall be sufficiently power averaged to ensure a standard deviation < 0.5 dB. | | |

The normative reference for this requirement is TS 38.101-1 [2] subclause 6.5.3.3.17.

6.5.3.3.3.18 Minimum conformance requirements (network signalling value "NS\_13")

When "NS\_13" is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 6.5.3.3.3.18-1. This requirement also applies for the frequency ranges that are less than FOOB (MHz) in Table 6.5.3.1.3-1 from the edge of the channel bandwidth.

Table 6.5.3.3.3.18-1: Additional requirements for “NS\_13”

|  |  |  |
| --- | --- | --- |
| Frequency band  (MHz) | Channel bandwidth /  Spectrum emission limit  (dBm) | Measurement bandwidth |
| 5 MHz |
| 806 ≤ f ≤ 816 | -42 | 6.25 kHz |
| NOTE 1: The requirement applies for NR carriers with lower channel edge at or above 817 MHz.  NOTE 2: The emissions measurement shall be sufficiently power averaged to ensure a standard deviation < 0.5 dB. | | |

The normative reference for this requirement is TS 38.101-1 [2] subclause 6.5.3.3.18.

6.5.3.3.3.19 Minimum conformance requirements (network signalling value "NS\_14")

When "NS\_14" is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 6.5.3.3.3.19-1. This requirement also applies for the frequency ranges that are less than FOOB (MHz) in Table 6.5.3.1.3-1 from the edge of the channel bandwidth.

Table 6.5.3.3.3.19-1: Additional requirements for “NS\_14”

|  |  |  |
| --- | --- | --- |
| Frequency band  (MHz) | Channel bandwidth /  Spectrum emission limit  (dBm) | Measurement bandwidth |
| 10 MHz, 15 MHz, 20MHz |
| 806 ≤ f ≤ 816 | -42 | 6.25 kHz |
| NOTE 1: The requirement applies for NR carriers with lower channel edge at or above 824 MHz.  NOTE 2: The emissions measurement shall be sufficiently power averaged to ensure a standard deviation < 0.5 dB. | | |

The normative reference for this requirement is TS 38.101-1 [2] subclause 6.5.3.3.19.

6.5.3.3.3.20 Minimum conformance requirements (network signalling value "NS\_15")

When "NS\_15" is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 6.5.3.3.20-1. This requirement also applies for the frequency ranges that are less than FOOB (MHz) in Table 6.5.3.1.3-1 from the edge of the channel bandwidth.

Table 6.5.3.3.3.20-1: Additional requirements NS\_15

|  |  |  |
| --- | --- | --- |
| Frequency band  (MHz) | Channel bandwidth /  Spectrum emission limit  (dBm) | Measurement bandwidth |
|  | 5 MHz, 10 MHz, 15 MHz, 20 MHz |  |
| 851 ≤ f ≤ 859 | -53 | 6.25 kHz |
| NOTE 1: The emissions measurement shall be sufficiently power averaged to ensure a standard deviation < 0.5 dB. | | |

6.5.3.3.3.21 Minimum conformance requirements (network signalling value "NS\_45")

When "NS\_45" is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 6.5.3.3.3.21-1. This requirement also applies for the frequency ranges that are less than FOOB (MHz) in Table 6.5.3.1.3-1 from the edge of the channel bandwidth.

Table 6.5.3.3.3.21-1: Additional requirements

|  |  |  |  |
| --- | --- | --- | --- |
| Frequency band  (MHz) | Channel bandwidth / Spectrum emission limit (dBm) | | Measurement bandwidth |
| 5 MHz | 10 MHz |
| 0.009 < f ≤ 2473.5 | -25 | -25 | 1 MHz |
| 2473.5 < f ≤ 2477.5 | -25 | -13 | 1 MHz |
| 2477.5 < f ≤ 2478.5 | -13 | -13 | 1 MHz |
| 2478.5< f ≤ 2483.5 | -10 | -10 | 1 MHz |
| 2495 ≤ f < 2496 | -13 | -13 | 1% of Channel Bandwidth |
| 2496 ≤ f < 2501 | -13 | -13 | 1 MHz |
| 2501 < f ≤ 2505 | -25 | -13 | 1 MHz |
| 2505 ≤ f ≤ 5th harmonic of the upper frequency edge of the UL operating band | -25 | -25 | 1 MHz |

The normative reference for this requirement is TS 38.101-1 [2] subclause 6.5.3.3.21.

6.5.3.3.3.22 Minimum conformance requirements (network signalling value "NS\_48" and “NS\_51”)

When "NS\_48" or “NS\_51” is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 6.5.3.3.3.22-1. This requirement also applies for the frequency ranges that are less than FOOB (MHz) in Table 6.5.3.1.3-1 from the edge of the channel bandwidth.

Table 6.5.3.3.3.22-1: Additional requirements for “NS\_48”

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Protected band | Frequency range (MHz) | | | Maximum Level (dBm) | MBW (MHz) | NOTE |
| E-UTRA band 34 –  NR band n34 | FDL\_low | - | FDL\_high | -50 | 1 |  |
| Frequency range | 1900 | - | 1915 | -15.5 | 5 | 1 |
| Frequency range | 1915 | - | 1920 | +1.6 | 5 | 1 |
| NOTE 1: For these adjacent bands, the emission limit could imply risk of harmful interference to UE(s) operating in the protected operating band. | | | | | | |

The normative reference for this requirement is TS 38.101-1 [2] subclause 6.5.3.3.22.

6.5.3.3.3.23 Minimum conformance requirements (network signalling value "NS\_49")

When "NS\_49" is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 6.5.3.3.3.23-1. This requirement also applies for the frequency ranges that are less than FOOB (MHz) in Table 6.5.3.1.3-1 from the edge of the channel bandwidth.

Table 6.5.3.3.3.23-1: Additional requirements for “NS\_49”

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Protected band | Frequency range (MHz) | | | Maximum Level (dBm) | MBW (MHz) | NOTE |
| E-UTRA band 34 -  NR band n34 | FDL\_low | - | FDL\_high | -50 | 1 |  |
| Frequency range | 1880 | - | 1895 | -40 | 1 |  |
| Frequency range | 1895 |  | 1915 | -15.5 | 5 | 1 |
| Frequency range | 1915 | - | 1920 | 1.6 | 5 | 1 |
| NOTE 1: For these adjacent bands, the emission limit could imply risk of harmful interference to UE(s) operating in the protected operating band. | | | | | | |

The normative reference for this requirement is TS 38.101-1 [2] subclause 6.5.3.3.23.

6.5.3.3.3.24 Minimum conformance requirements (network signalling value "NS\_44")

When "NS\_44" is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 6.5.3.3.3.24-1. This requirement also applies for the frequency ranges that are less than FOOB (MHz) in Table 6.5.3.1.3-1 from the edge of the channel bandwidth.

Table 6.5.3.3.3.24-1: Additional requirements for “NS\_44”

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Protected band | Frequency range (MHz) | | | Maximum Level (dBm) | MBW (MHz) | NOTE |
| Frequency range | 2620 | - | 2645 | -15.5 | 5 | 1, 2 |
| Frequency range | 2645 | - | 2690 | -40 | 1 | 1 |
| NOTE 1: This requirement is applicable for carriers confined in 2570-2615 MHz.  NOTE 2: For these adjacent bands, the emission limit could imply risk of harmful interference to UE(s) operating in the protected operating band. | | | | | | |

The normative reference for this requirement is TS 38.101-1 [2] subclause 6.5.3.3.24.

6.5.3.3.3.25 Minimum conformance requirements (network signalling value "NS\_46")

When "NS\_46" is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 6.5.3.3.25-1. This requirement also applies for the frequency ranges that are less than FOOB (MHz) in Table 6.5.3.1-1 from the edge of the channel bandwidth.

Table 6.5.3.3.25-1: Additional requirements for “NS\_46”

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Protected band | Frequency range (MHz) | | | Maximum Level (dBm) | MBW (MHz) | NOTE |
| Frequency range | 2570 | - | 2575 | +1.6 | 5 | 1, 2 |
| Frequency range | 2575 | - | 2595 | -15.5 | 5 | 1, 2 |
| Frequency range | 2595 | - | 2620 | -40 | 1 | 1 |
| NOTE 1: This requirement is applicable for all carriers confined in 2500-2570 MHz. Special restrictions apply for channel bandwidths up to 20MHz: For carriers of 15 MHz bandwidth when carrier centre frequency is within the range 2560.5 - 2562.5 MHz and for carriers of 20 MHz bandwidth when carrier centre frequency is within the range 2552 - 2560 MHz the requirement is applicable only for an uplink transmission bandwidth less than or equal to 54 RB with the minimum supported SCS of 15KHz.  NOTE 2: For these adjacent bands, the emission limit could imply risk of harmful interference to UE(s) operating in the protected operating band. | | | | | | |

The normative reference for this requirement is TS 38.101-1 [2] subclause 6.5.3.3.25.

6.5.3.3.3.26 Minimum conformance requirements (network signalling value "NS\_07")

6.5.3.3.26-1. This requirement also applies for the frequency ranges that are less than FOOB (MHz) in Table 6.5.3.1-1 from the edge of the channel bandwidth.

Table 6.5.3.3.26-1: Additional requirements

|  |  |  |
| --- | --- | --- |
| Frequency band  (MHz) | Channel bandwidth / Spectrum emission limit (dBm) | Measurement bandwidth |
| 10 MHz |
| 769 ≤ f ≤ 775 | -57 | 6.25 kHz |
| NOTE: The emissions measurement shall be sufficiently power averaged to ensure standard standard deviation < 0.5 dB. | | |

The normative reference for this requirement is TS 38.101-1 [2] subclause 6.5.3.3.26.

6.5.3.3.3.27 Minimum conformance requirements (network signalling value "NS\_56")

When "NS\_56" is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 6.5.3.3.3.27-1. This requirement also applies for the frequency ranges that are less than FOOB (MHz) in Table 6.5.3.1.3-1 from the edge of the channel bandwidth.

Table 6.5.3.3.27-1: Additional requirements

|  |  |  |  |
| --- | --- | --- | --- |
| Frequency band  (MHz) | Channel bandwidth / Spectrum emission limit1 (dBm) | Measurement bandwidth | NOTE |
| 5 MHz, 10MHz |
| 1541 ≤ f ≤ 1559 | -102 | 2kHz | Averaged over any 2 millisecond active transmission interval |
| 1559≤ f ≤ 1608 | -85 | 700Hz |  |
| 1608≤ f ≤ 1610 | -85 +5/2 (f-1608) | 700Hz |  |
| 1610≤ f ≤ 1625 | -80+ 66/15 (f-1610) | 700Hz |  |
| 1541 ≤ f ≤ 1608 | -75 | 1MHz | Averaged over any 2 millisecond active transmission interval |
| 1608≤ f ≤ 1610 | -75 + 5/2 (f-1608) | 1MHz |  |
| 1610≤ f ≤ 1627.5 | -70+ 57/17.5 (f-1610) | 1MHz |  |
| 1627.5 | -37 | 4kHz |  |
| 1638.5 ≤f ≤ 1645.5 | -28 | 4kHz |  |
| 1657.5 ≤f ≤ 1660.5 | -28 | 4kHz |  |
| NOTE 1: The EIRP requirement in regulation is converted to conducted requirement using a 0 dBi antenna. | | | |

The normative reference for this requirement is TS 38.101-1 [2] subclause 6.5.3.3.27.

6.5.3.3.4 Test description

6.5.3.3.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, test channel bandwidths and sub-carrier spacing based on NR operating bands specified in Table 5.3.5-1. All these configurations shall be tested with applicable test parameters for each channel bandwidth and sub-carrier spacing, are shown in Tables 6.5.3.3.4.1-1 through Table 6.5.3.3.4.1-27 for different NS values. The details of the uplink reference measurement channels (RMCs) are specified in Annex A.2.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Table 6.5.3.3.4.1-1: Test Configuration Table (network signalling value "NS\_04")

Same test configuration as listed in Table 6.2.3.4.1-2 shall be used.

Table 6.5.3.3.4.1-2: Test Configuration Table (network signalling value "NS\_17")

|  |  |  |  |
| --- | --- | --- | --- |
| Initial Conditions | | | |
| Test Environment as specified in TS 38.508-1 [5] subclause 4.1 | | Normal | |
| Test Frequencies as specified in TS 38.508-1 [5] subclause 4.3.1 | | Mid range | |
| Test Channel Bandwidths as specified in TS 38.508-1 [5] subclause 4.3.1 | | 5MHz, 10MHz | |
| Test SCS as specified in Table 5.3.5-1 | | Lowest | |
| Test Parameters | | | |
| Test ID | Downlink Configuration | Uplink Configuration | |
|  | N/A | Modulation | RB allocation (NOTE 1) |
| 1 | CP-OFDM QPSK | OuterFull |
| 2 | CP-OFDM QPSK | Edge\_1RB\_Left |
| NOTE 1: The specific configuration of each RB allocation is defined in Table 6.1-1 Common UL configuration | | | |

Table 6.5.3.3.4.1-3: Test Configuration Table (network signalling value "NS\_18")

Same test configuration as listed in Table 6.2.3.4.1-11 shall be used with the following exceptions:

Test SCS shall be: No exception for UE mean power testing(step 3) and only Lowest for additional spurious emission testing(step 4).

Table 6.5.3.3.4.1-4: Test Configuration Table (network signalling value "NS\_05" and "NS\_05U")

Same test configuration as listed in Table 6.2.3.4.1-4 and Table 6.2.3.4.1-4a for NS\_05, Table 6.2.3.4.1-4a and Table 6.2.3.4.1-5 for NS\_05U shall be used with the following exceptions:

- Test SCS shall be: No exception for UE mean power testing(step 3) and only Lowest for additional spurious emission testing(step 4).

Table 6.5.3.3.4.1-5: Test Configuration Table (network signalling value "NS\_43" and "NS\_43U")

Same test configuration as listed in Table 6.2.3.4.1-6 for NS\_43 and Table 6.2.3.4.1-7 for NS\_43U shall be used

Table 6.5.3.3.4.1-6: Test Configuration Table (network signalling value "NS\_37")

Same test configuration as listed in Table 6.2.3.4.1-8 shall be used

Table 6.5.3.3.4.1-7: Test Configuration Table (network signalling value "NS\_38")

Same test configuration as listed in Table 6.2.3.4.1-9 shall be used.

Table 6.5.3.3.4.1-8: Test Configuration Table (network signalling value "NS\_39")

Same test configuration as listed in Table 6.2.3.4.1-10 shall be used.

Table 6.5.3.3.4.1-9: Test Configuration Table (network signalling value "NS\_40")

Same test configuration as listed in Table 6.2.3.4.1-14 shall be used.

Table 6.5.3.3.4.1-10: Test Configuration Table (network signalling value "NS\_41")

Same test configuration as listed in Table 6.2.3.4.1-15 shall be used.

Table 6.5.3.3.4.1-11: Test Configuration Table (network signalling value "NS\_42")

Same test configuration as listed in Table 6.2.3.4.1-16 shall be used.

Table 6.5.3.3.4.1-12: Test Configuration Table (network signalling value "NS\_45")

Same test configuration as listed in Table 6.2.3.4.1-28 shall be used.

Table 6.5.3.3.4.1-13: Test Configuration Table (network signalling value "NS\_24")

Same test configuration as listed in Table 6.2.3.4.1-12 shall be used.

Table 6.5.3.3.4.1-14: Test Configuration Table (network signalling value "NS\_27")

Same test configuration as listed in Table 6.2.3.4.1-13 shall be used

Table 6.5.3.3.4.1-15: Test Configuration Table (network signalling value "NS\_47")

Same test configuration as listed in Table 6.2.3.4.1-17, Table 6.2.3.4.1-17a, Table 6.2.3.4.1-18 and Table 6.2.3.4.1-18A shall be used.

Table 6.5.3.3.4.1-16: Test Configuration Table (network signalling value "NS\_50")

Same test configuration as listed in Table 6.2.3.4.1-31 shall be used for NS\_50 (Power Class 3).

Same test configuration as listed in Table 6.2.3.4.1-32 shall be used for NS\_50 (Power Class 2).

Table 6.5.3.3.4.1-17: Test Configuration Table (network signalling value "NS\_12")

Same test configuration as listed in Table 6.2.3.4.1-21 shall be used.

Table 6.5.3.3.4.1-18: Test Configuration Table (network signalling value "NS\_13")

Same test configuration as listed in Table 6.2.3.4.1-22 shall be used.

Table 6.5.3.3.4.1-19: Test Configuration Table (network signalling value "NS\_14")

Same test configuration as listed in Table 6.2.3.4.1-23 shall be used with the following exceptions:

- Test Frequency shall be: No exception for UE mean power testing(step 3) and only High Range for additional spurious emission testing(step 4).

Table 6.5.3.3.4.1-20: Test Configuration Table (network signalling value "NS\_15")

Same test configuration as listed in Table 6.2.3.4.1-24 shall be used.

Table 6.5.3.3.4.1-21: Test Configuration Table (network signalling value "NS\_07")

Same test configuration as listed in Table 6.2.3.4.1-31 shall be used.

Table 6.5.3.3.4.1-22: Test Configuration Table (network signalling value "NS\_48")

Same test configuration as listed in Table 6.2.3.4.1-19 and Table 6.2.3.4.1-20 shall be used.

Table 6.5.3.3.4.1-23: Test Configuration Table (network signalling value "NS\_49")

Same test configuration as listed in Table 6.2.3.4.1-29 and Table 6.2.3.4.1-29a shall be used.

Table 6.5.3.3.4.1-24: Test Configuration Table (network signalling value "NS\_44")

Same test configuration as listed in Table 6.2.3.4.1-26 shall be used with the following exceptions:

- Test SCS shall be: No exception for UE mean power testing(step 3) and only Lowest for additional spurious emission testing(step 4).

Table 6.5.3.3.4.1-25: Test Configuration Table (network signalling value "NS\_21")

Same test configuration as listed in Table 6.2.3.4.1-27shall be used.

Table 6.5.3.3.4.1-27: Test Configuration Table (network signalling value "NS\_56")

Same test configuration as listed in Table 6.2.3.4.1-30 shall be used.

Table 6.5.3.3.4.1-28: Test Configuration Table (network signalling value "NS\_46")

Same test configuration as listed in Table 6.2.3.4.1-25 shall be used.

1. Connect the SS to the UE to the UE antenna connectors as shown in TS 38.508-1 [5] Annex A, Figure A.3.1.1.1 for TE diagram and section A.3.2 for UE diagram.

2. The parameter settings for the cell are set up according to TS 38.508-1 [5] subclause 4.4.3.

3. Downlink signals are initially set up according to Annex C.0, C.1, C.2, and uplink signals according to Annex G.0, G.1, G.2, G.3.0.

4. The UL Reference Measurement channels are set according to Table 6.5.3.3.4.1-1 through Table 6.5.3.3.4.1-27.

5. Propagation conditions are set according to Annex B.0.

6. Ensure the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On,* Test Mode *On* and Test Loop Function *On* according to TS 38.508-1 [5] clause 4.5. Message contents are defined in clause 6.5.3.3.4.3.

6.5.3.3.4.2 Test procedure

1. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0\_1 for C\_RNTI to schedule the UL RMC according to Table 6.5.3.3.4.1-1 through Table 6.5.3.3.4.1-28. Since the UE has no payload data to send, the UE transmits uplink MAC padding bits on the UL RMC.

2. Send continuously uplink power control "up" commands in the uplink scheduling information to the UE until the UE transmits at PUMAX level.

3. Measure the mean power of the UE in the channel bandwidth of the radio access mode according to the test configuration in Tables 6.5.3.3.4.1-1 through 6.5.3.3.4.1-28 as appropriate, which shall meet the requirements in clause 6.5.3.3.5 with allowed A-MPR values specified in 6.2.3.5. The measured power shall be verified for each step. The measurement period shall capture the active time slots.

4. Measure the power of the transmitted signal with a measurement filter of bandwidths according to clauses 6.5.3.3.3.1 to 6.5.3.3.3.27 as appropriate. The centre frequency of the filter shall be stepped in contiguous steps according to the same table. During measurement the spectrum analyser shall be set to 'Detector' = RMS. If the sweep count is higher than one, the trace mode shall be average. For NS\_38, NS\_40, NS\_41 the additional spurious emissions requirement shall be verified with UE transmission power obtained by sending uplink power control commands to the UE using 1dB power step size to ensure that the UE output power measured by the test system is within the Uplink power control window, defined as -MU to -(MU + Uplink power control window size) dB of the target power level 15dBm for at least the duration of the additional spurious emissions measurement, where:

- MU is the test system uplink power measurement uncertainty and is specified in Table F.1.3-1 for the carrier frequency f and the channel bandwidth BW

- Uplink power control window size = 1dB (UE power step size) + 0.7dB (UE power step tolerance) + (Test system relative power measurement uncertainty), where, the UE power step tolerance is specified in Table 6.3.4.3.3-1 and is 0.7dB for 1dB power step size, and the Test system relative power measurement uncertainty is specified for test case 6.3.4.3 in Table F.1.2-1

6.5.3.3.4.3 Message contents

6.5.3.3.4.3.1 Message contents exceptions (network signalling value "NS\_04")

Message contents are according to TS 38.508-1 [5] subclause 4.6, with the following exceptions:

1. Information element additionalSpectrumEmission is set to NS\_04. This can be set in *SIB1* as part of the cell broadcast message. This exception indicates that the UE shall meet the additional spurious emission requirement for a specific deployment scenario.

Table 6.5.3.3.4.3.1-1: *AdditionalSpectrumEmission: A*dditional spurious emissions test requirement for "NS\_04"

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [5] clause 4.6.3, Table 4.6.3-1 | | | |
| Information Element | Value/remark | Comment | Condition |
| additionalSpectrumEmission | 1 (NS\_04) |  |  |

6.5.3.3.4.3.2 Message contents exceptions (network signalling value "NS\_17")

Message contents are according to TS 38.508-1 [5] subclause 4.6, with the following exceptions:

1. Information element additionalSpectrumEmission is set to NS\_17. This can be set in *SIB1* as part of the cell broadcast message. This exception indicates that the UE shall meet the additional spurious emission requirement for a specific deployment scenario.

Table 6.5.3.3.4.3.2-1: *AdditionalSpectrumEmission: A*dditional spurious emissions test requirement for "NS\_17"

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [5] clause 4.6.3, Table 4.6.3-1 | | | |
| Information Element | Value/remark | Comment | Condition |
| additionalSpectrumEmission | 1 (NS\_17) |  |  |

6.5.3.3.4.3.3 Message contents exceptions (network signalling value "NS\_18")

Message contents are according to TS 38.508-1 [5] subclause 4.6, with the following exceptions:

1. Information element additionalSpectrumEmission is set to NS\_18. This can be set in *SIB1* as part of the cell broadcast message. This exception indicates that the UE shall meet the additional spurious emission requirement for a specific deployment scenario.

Table 6.5.3.3.4.3.3-1: *AdditionalSpectrumEmission: A*dditional spurious emissions test requirement for "NS\_18"

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [5] clause 4.6.3, Table 4.6.3-1 | | | |
| Information Element | Value/remark | Comment | Condition |
| additionalSpectrumEmission | 2 (NS\_18) |  |  |

6.5.3.3.4.3.4 Message contents exceptions (network signalling value "NS\_05")

Message contents are according to TS 38.508-1 [5] subclause 4.6, with the following exceptions:

1. Information element additionalSpectrumEmission is set to NS\_05. This can be set in *SIB1* as part of the cell broadcast message. This exception indicates that the UE shall meet the additional spurious emission requirement for a specific deployment scenario.

Table 6.5.3.3.4.3.4-1: *AdditionalSpectrumEmission: A*dditional spurious emissions test requirement for "NS\_05"

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [5] clause 4.6.3, Table 4.6.3-1 | | | |
| Information Element | Value/remark | Comment | Condition |
| additionalSpectrumEmission | 2 (NS\_05) |  |  |

6.5.3.3.4.3.4a Message contents exceptions (network signalling value "NS\_05U")

Message contents are according to TS 38.508-1 [5] subclause 4.6, with the following exceptions:

1. Information element additionalSpectrumEmission is set to NS\_05U. This can be set in *SIB1* as part of the cell broadcast message. This exception indicates that the UE shall meet the additional spurious emission requirement for a specific deployment scenario.

Table 6.5.3.3.4.3.4a-1: *AdditionalSpectrumEmission: A*dditional spurious emissions test requirement for "NS\_05U"

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [5] clause 4.6.3, Table 4.6.3-1 | | | |
| Information Element | Value/remark | Comment | Condition |
| additionalSpectrumEmission | 3 (NS\_05U) |  |  |

6.5.3.3.4.3.5 Message contents exceptions (network signalling value "NS\_43")

Message contents are according to TS 38.508-1 [5] subclause 4.6, with the following exceptions:

1. Information element additionalSpectrumEmission is set to NS\_43. This can be set in *SIB1* as part of the cell broadcast message. This exception indicates that the UE shall meet the additional spurious emission requirement for a specific deployment scenario.

Table 6.5.3.3.4.3.5-1: *AdditionalSpectrumEmission: A*dditional spurious emissions test requirement for "NS\_43"

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [5] clause 4.6.3, Table 4.6.3-1 | | | |
| Information Element | Value/remark | Comment | Condition |
| additionalSpectrumEmission | 2 (NS\_43) |  |  |

6.5.3.3.4.3.5a Message contents exceptions (network signalling value "NS\_43U")

Message contents are according to TS 38.508-1 [5] subclause 4.6, with the following exceptions:

1. Information element additionalSpectrumEmission is set to NS\_43U. This can be set in *SIB1* as part of the cell broadcast message. This exception indicates that the UE shall meet the additional spurious emission requirement for a specific deployment scenario.

Table 6.5.3.3.4.3.5a-1: *AdditionalSpectrumEmission: A*dditional spurious emissions test requirement for "NS\_43U"

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [5] clause 4.6.3, Table 4.6.3-1 | | | |
| Information Element | Value/remark | Comment | Condition |
| additionalSpectrumEmission | 3 (NS\_43U) |  |  |

6.5.3.3.4.3.6 Message contents exceptions (network signalling value "NS\_37")

Message contents are according to TS 38.508-1 [5] subclause 4.6, with the following exceptions:

1. Information element additionalSpectrumEmission is set to NS\_37. This can be set in *SIB1* as part of the cell broadcast message. This exception indicates that the UE shall meet the additional spurious emission requirement for a specific deployment scenario.

Table 6.5.3.3.4.3.6-1: *AdditionalSpectrumEmission: A*dditional spurious emissions test requirement for "NS\_37"

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [5] clause 4.6.3, Table 4.6.3-1 | | | |
| Information Element | Value/remark | Comment | Condition |
| additionalSpectrumEmission | 1 (NS\_37) |  |  |

6.5.3.3.4.3.7 Message contents exceptions (network signalling value "NS\_38")

Message contents are according to TS 38.508-1 [5] subclause 4.6, with the following exceptions:

1. Information element additionalSpectrumEmission is set to NS\_38. This can be set in *SIB1* as part of the cell broadcast message. This exception indicates that the UE shall meet the additional spurious emission requirement for a specific deployment scenario.

Table 6.5.3.3.4.3.7-1: *AdditionalSpectrumEmission: A*dditional spurious emissions test requirement for "NS\_38"

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [5] clause 4.6.3, Table 4.6.3-1 | | | |
| Information Element | Value/remark | Comment | Condition |
| additionalSpectrumEmission | 2 (NS\_38) |  |  |

6.5.3.3.4.3.8 Message contents exceptions (network signalling value "NS\_39")

Message contents are according to TS 38.508-1 [5] subclause 4.6, with the following exceptions:

1. Information element additionalSpectrumEmission is set to NS\_39. This can be set in *SIB1* as part of the cell broadcast message. This exception indicates that the UE shall meet the additional spurious emission requirement for a specific deployment scenario.

Table 6.5.3.3.4.3.8-1: *AdditionalSpectrumEmission: A*dditional spurious emissions test requirement for "NS\_39"

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [5] clause 4.6.3, Table 4.6.3-1 | | | |
| Information Element | Value/remark | Comment | Condition |
| additionalSpectrumEmission | 3 (NS\_39) |  |  |

6.5.3.3.4.3.9 Message contents exceptions (network signalling value "NS\_40")

Message contents are according to TS 38.508-1 [5] subclause 4.6, with the following exceptions:

1. Information element additionalSpectrumEmission is set to NS\_40. This can be set in *SIB1* as part of the cell broadcast message. This exception indicates that the UE shall meet the additional spurious emission requirement for a specific deployment scenario.

Table 6.5.3.3.4.3.9-1: *AdditionalSpectrumEmission: A*dditional spurious emissions test requirement for "NS\_40"

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [5] clause 4.6.3, Table 4.6.3-1 | | | |
| Information Element | Value/remark | Comment | Condition |
| additionalSpectrumEmission | 1 (NS\_40) |  |  |

6.5.3.3.4.3.10 Message contents exceptions (network signalling value "NS\_41")

Message contents are according to TS 38.508-1 [5] subclause 4.6, with the following exceptions:

1. Information element additionalSpectrumEmission is set to NS\_41. This can be set in *SIB1* as part of the cell broadcast message. This exception indicates that the UE shall meet the additional spurious emission requirement for a specific deployment scenario.

Table 6.5.3.3.4.3.10-1: *AdditionalSpectrumEmission: A*dditional spurious emissions test requirement for "NS\_41"

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [5] clause 4.6.3, Table 4.6.3-1 | | | |
| Information Element | Value/remark | Comment | Condition |
| additionalSpectrumEmission | 1 (NS\_41) |  |  |

6.5.3.3.4.3.11 Message contents exceptions (network signalling value "NS\_42")

Message contents are according to TS 38.508-1 [5] subclause 4.6, with the following exceptions:

1. Information element additionalSpectrumEmission is set to NS\_42. This can be set in *SIB1* as part of the cell broadcast message. This exception indicates that the UE shall meet the additional spurious emission requirement for a specific deployment scenario.

Table 6.5.3.3.4.3.11-1: *AdditionalSpectrumEmission: A*dditional spurious emissions test requirement for "NS\_42"

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [5] clause 4.6.3, Table 4.6.3-1 | | | |
| Information Element | Value/remark | Comment | Condition |
| additionalSpectrumEmission | 2 (NS\_42) |  |  |

6.5.3.3.4.3.12 Message contents exceptions (network signalling value "NS\_21")

Message contents are according to TS 38.508-1 [5] subclause 4.6, with the following exceptions:

1. Information element additionalSpectrumEmission is set to NS\_21. This can be set in *SIB1* as part of the cell broadcast message. This exception indicates that the UE shall meet the additional spurious emission requirement for a specific deployment scenario.

Table 6.5.3.3.4.3.12-1: *AdditionalSpectrumEmission: A*dditional spurious emissions test requirement for "NS\_21"

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [5] clause 4.6.3, Table 4.6.3-1 | | | |
| Information Element | Value/remark | Comment | Condition |
| additionalSpectrumEmission | 1 (NS\_21) |  |  |

6.5.3.3.4.3.13 Message contents exceptions (network signalling value "NS\_24")

Message contents are according to TS 38.508-1 [5] subclause 4.6, with the following exceptions:

1. Information element additionalSpectrumEmission is set to NS\_24. This can be set in *SIB1* as part of the cell broadcast message. This exception indicates that the UE shall meet the additional spurious emission requirement for a specific deployment scenario.

Table 6.5.3.3.4.3.13-1: *AdditionalSpectrumEmission: A*dditional spurious emissions test requirement for "NS\_24"

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [5] clause 4.6.3, Table 4.6.3-1 | | | |
| Information Element | Value/remark | Comment | Condition |
| additionalSpectrumEmission | 1 (NS\_24) |  |  |

6.5.3.3.4.3.14 Message contents exceptions (network signalling value "NS\_27")

Message contents are according to TS 38.508-1 [5] subclause 4.6, with the following exceptions:

1. Information element additionalSpectrumEmission is set to NS\_27. This can be set in *SIB1* as part of the cell broadcast message. This exception indicates that the UE shall meet the additional spurious emission requirement for a specific deployment scenario.

Table 6.5.3.3.4.3.14-1: *AdditionalSpectrumEmission: A*dditional spurious emissions test requirement for "NS\_27"

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [5] clause 4.6.3, Table 4.6.3-1 | | | |
| Information Element | Value/remark | Comment | Condition |
| additionalSpectrumEmission | 1 (NS\_27) |  |  |

6.5.3.3.4.3.15 Message contents exceptions (network signalling value "NS\_47")

1. Information element additionalSpectrumEmission is set to NS\_47. This can be set in the *SIB1* as part of the cell broadcast message. This exception indicates that the UE shall meet the additional spurious emission requirement for a specific deployment scenario.

Table 6.5.3.3.4.3.15-1: AdditionalSpectrumEmission: Additional spurious emissions test requirement for "NS\_47"

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [5], Table 4.6.3-1 | | | |
| Information Element | Value/remark | Comment | Condition |
| additionalSpectrumEmission | 2 (NS\_47) |  |  |

6.5.3.3.4.3.16 Message contents exceptions (network signalling value "NS\_50")

Message contents are according to TS 38.508-1 [5] subclause 4.6, with the following exceptions:

1. Information element additionalSpectrumEmission is set to NS\_50. This can be set in *SIB1* as part of the cell broadcast message. This exception indicates that the UE shall meet the additional spurious emission requirement for a specific deployment scenario.

Table 6.5.3.3.4.3.16-1: *AdditionalSpectrumEmission: A*dditional spurious emissions test requirement for "NS\_50"

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [5] clause 4.6.3, Table 4.6.3-1 | | | |
| Information Element | Value/remark | Comment | Condition |
| additionalSpectrumEmission | 1 (NS\_50) |  |  |

6.5.3.3.4.3.17 Message contents exceptions (network signalling value "NS\_12")

Message contents are according to TS 38.508-1 [5] subclause 4.6, with the following exceptions:

1. Information element additionalSpectrumEmission is set to NS\_12. This can be set in *SIB1* as part of the cell broadcast message. This exception indicates that the UE shall meet the additional spurious emission requirement for a specific deployment scenario.

Table 6.5.3.3.4.3.17-1: *AdditionalSpectrumEmission: A*dditional spurious emissions test requirement for "NS\_12"

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [5] clause 4.6.3, Table 4.6.3-1 | | | |
| Information Element | Value/remark | Comment | Condition |
| additionalSpectrumEmission | 1 (NS\_12) |  |  |

6.5.3.3.4.3.18 Message contents exceptions (network signalling value "NS\_13")

Message contents are according to TS 38.508-1 [5] subclause 4.6, with the following exceptions:

1. Information element additionalSpectrumEmission is set to NS\_13. This can be set in *SIB1* as part of the cell broadcast message. This exception indicates that the UE shall meet the additional spurious emission requirement for a specific deployment scenario.

Table 6.5.3.3.4.3.18-1: *AdditionalSpectrumEmission: A*dditional spurious emissions test requirement for "NS\_13"

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [5] clause 4.6.3, Table 4.6.3-1 | | | |
| Information Element | Value/remark | Comment | Condition |
| additionalSpectrumEmission | 1 (NS\_13) |  |  |

6.5.3.3.4.3.19 Message contents exceptions (network signalling value "NS\_14")

Message contents are according to TS 38.508-1 [5] subclause 4.6, with the following exceptions:

1. Information element additionalSpectrumEmission is set to NS\_14. This can be set in *SIB1* as part of the cell broadcast message. This exception indicates that the UE shall meet the additional spurious emission requirement for a specific deployment scenario.

Table 6.5.3.3.4.3.19-1: *AdditionalSpectrumEmission: A*dditional spurious emissions test requirement for "NS\_14"

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [5] clause 4.6.3, Table 4.6.3-1 | | | |
| Information Element | Value/remark | Comment | Condition |
| additionalSpectrumEmission | 1 (NS\_14) |  |  |

6.5.3.3.4.3.20 Message contents exceptions (network signalling value "NS\_15")

Message contents are according to TS 38.508-1 [5] subclause 4.6, with the following exceptions:

1. Information element additionalSpectrumEmission is set to NS\_15. This can be set in *SIB1* as part of the cell broadcast message. This exception indicates that the UE shall meet the additional spurious emission requirement for a specific deployment scenario.

Table 6.5.3.3.4.3.20-1: *AdditionalSpectrumEmission: A*dditional spurious emissions test requirement for "NS\_15"

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [5] clause 4.6.3, Table 4.6.3-1 | | | |
| Information Element | Value/remark | Comment | Condition |
| additionalSpectrumEmission | 1 (NS\_15) |  |  |

6.5.3.3.4.3.21 Message contents exceptions (network signalling value "NS\_45")

Message contents are according to TS 38.508-1 [5] subclause 4.6, with the following exceptions:

1. Information element additionalSpectrumEmission is set to NS\_45. This can be set in *SIB1* as part of the cell broadcast message. This exception indicates that the UE shall meet the additional spurious emission requirement for a specific deployment scenario.

Table 6.5.3.3.4.3.21-1: *AdditionalSpectrumEmission*: Additional spurious emissions test requirement for "NS\_45"

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [5], Table 4.6.3-1 | | | |
| Information Element | Value/remark | Comment | Condition |
| additionalSpectrumEmission | 1 (NS\_45) |  |  |

6.5.3.3.4.3.22 Message contents exceptions (network signalling value "NS\_48")

Message contents are according to TS 38.508-1 [5] subclause 4.6, with the following exceptions:

1. Information element additionalSpectrumEmission is set to NS\_48. This can be set in *SIB1* as part of the cell broadcast message. This exception indicates that the UE shall meet the additional spurious emission requirement for a specific deployment scenario.

Table 6.5.3.3.4.3.22-1: *AdditionalSpectrumEmission: A*dditional spurious emissions test requirement for "NS\_48"

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [5] clause 4.6.3, Table 4.6.3-1 | | | |
| Information Element | Value/remark | Comment | Condition |
| additionalSpectrumEmission | 4 (NS\_48) |  |  |

6.5.3.3.4.3.23 Message contents exceptions (network signalling value "NS\_49")

Message contents are according to TS 38.508-1 [5] subclause 4.6, with the following exceptions:

1. Information element additionalSpectrumEmission is set to NS\_49. This can be set in *SIB1* as part of the cell broadcast message. This exception indicates that the UE shall meet the additional spurious emission requirement for a specific deployment scenario.

Table 6.5.3.3.4.3.23-1: *AdditionalSpectrumEmission: A*dditional spurious emissions test requirement for "NS\_49"

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [5] clause 4.6.3, Table 4.6.3-1 | | | |
| Information Element | Value/remark | Comment | Condition |
| additionalSpectrumEmission | 5 (NS\_49) |  |  |

6.5.3.3.4.3.24 Message contents exceptions (network signalling value "NS\_44")

Message contents are according to TS 38.508-1 [5] subclause 4.6, with the following exceptions:

1. Information element additionalSpectrumEmission is set to NS\_44. This can be set in *SIB1* as part of the cell broadcast message. This exception indicates that the UE shall meet the additional spurious emission requirement for a specific deployment scenario.

Table 6.5.3.3.4.3.24-1: *AdditionalSpectrumEmission: A*dditional spurious emissions test requirement for "NS\_44"

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [5] clause 4.6.3, Table 4.6.3-1 | | | |
| Information Element | Value/remark | Comment | Condition |
| additionalSpectrumEmission | 1 (NS\_44) |  |  |

6.5.3.3.4.3.25 Message contents exceptions (network signalling value "NS\_46")

Message contents are according to TS 38.508-1 [5] subclause 4.6, with the following exceptions:

1. Information element additionalSpectrumEmission is set to NS\_46. This can be set in *SIB1* as part of the cell broadcast message. This exception indicates that the UE shall meet the additional spurious emission requirement for a specific deployment scenario.

Table 6.5.3.3.4.3.25-1: *AdditionalSpectrumEmission: A*dditional spurious emissions test requirement for "NS\_46"

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [5] clause 4.6.3, Table 4.6.3-1 | | | |
| Information Element | Value/remark | Comment | Condition |
| additionalSpectrumEmission | 1 (NS\_46) |  |  |

6.5.3.3.4.3.26 Message contents exceptions (network signalling value "NS\_07")

Message contents are according to TS 38.508-1 [5] subclause 4.6, with the following exceptions:

1. Information element additionalSpectrumEmission is set to NS\_07. This can be set in *SIB1* as part of the cell broadcast message. This exception indicates that the UE shall meet the additional spurious emission requirement for a specific deployment scenario.

Table 6.5.3.3.4.3.26-1: *AdditionalSpectrumEmission: A*dditional spurious emissions test requirement for "NS\_07"

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [5] clause 4.6.3, Table 4.6.3-1 | | | |
| Information Element | Value/remark | Comment | Condition |
| additionalSpectrumEmission | 1 (NS\_07) |  |  |

6.5.3.3.4.3.27 Message contents exceptions (network signalling value "NS\_56")

Message contents are according to TS 38.508-1 [5] subclause 4.6, with the following exceptions:

1. Information element additionalSpectrumEmission is set to NS\_56. This can be set in *SIB1* as part of the cell broadcast message. This exception indicates that the UE shall meet the additional spurious emission requirement for a specific deployment scenario.

Table 6.5.3.3.4.3.27-1: *AdditionalSpectrumEmission: A*dditional spurious emissions test requirement for "NS\_56"

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [5] clause 4.6.3, Table 4.6.3-1 | | | |
| Information Element | Value/remark | Comment | Condition |
| additionalSpectrumEmission | 1 (NS\_56) |  |  |

6.5.3.3.5 Test requirement

This clause specifies the requirements for the specified NR band for an additional spectrum emission requirement with protected bands as indicated from Table 6.5.3.3.5.1 to Table 6.5.3.3.5.27 for different NS\_values.

NOTE: For measurement conditions at the edge of each frequency range, the lowest frequency of the measurement position in each frequency range should be set at the lowest boundary of the frequency range plus MBW/2. The highest frequency of the measurement position in each frequency range should be set at the highest boundary of the frequency range minus MBW/2. MBW denotes the measurement bandwidth defined for the protected band.

6.5.3.3.5.1 Test requirement (network signalling value “NS\_04”)

When "NS 04" is indicated in the cell,

The measured UE mean power in the channel bandwidth, derived in step 3, shall fulfil requirements in Table 6.2.3.5-2 for power class 2 UE, and Table 6.2.3.5-3 for power class 3 UE.

The power of any UE emission shall not exceed the levels specified in Table 6.5.3.3.5.1-1. This requirement also applies for the frequency ranges that are less than FOOB (MHz) in Table 6.5.3.1.3-1 from the edge of the channel bandwidth.

Table 6.5.3.3.5.1-1: Additional requirements

|  |  |  |
| --- | --- | --- |
| Frequency band  (MHz) | Channel bandwidth / Spectrum emission limit (dBm) | Measurement bandwidth |
| 10, 15, 20, 30, 40, 50, 60, 70, 80, 90, 100 (MHz) |
| 2495 ≤ f < 2496 | -13 | 1% of Channel BW |
| 2490.5 ≤ f < 2495 | -13 | 1 MHz |
| 0.009 < f < 2490.5 | -25 | 1 MHz |

6.5.3.3.5.2 Test requirement (network signalling value “NS\_17”)

When "NS\_17" is indicated in the cell,

The power of any UE emission shall not exceed the levels specified in Table 6.5.3.3.5.2-1. This requirement also applies for the frequency ranges that are less than FOOB (MHz) in Table 6.5.3.1.3-1 and Table 6.5.3.1.3-2 from the edge of the channel bandwidth.

Table 6.5.3.3.5.2-1: Additional requirements for "NS\_17"

|  |  |  |  |
| --- | --- | --- | --- |
| Frequency band  (MHz) | Channel bandwidth / Spectrum emission limit (dBm) | Measurement bandwidth | NOTE |
| 5, 10 MHz |
| 470 ≤ f ≤ 710 | -26.2 | 6 MHz | 1 |
| NOTE 1: Applicable when the assigned E-UTRA carrier is confined within 718 MHz and 748 MHz and when the channel bandwidth used is 5 or 10 MHz. | | | |

6.5.3.3.5.3 Test requirement (network signalling value “NS\_18”)

When "NS\_18" is indicated in the cell,

The measured UE mean power in the channel bandwidth, derived in step 3, shall fulfil requirements in Table 6.2.3.5-8 for power class 3 UE.

The power of any UE emission shall not exceed the levels specified in Table 6.5.3.3.5.3-1. This requirement also applies for the frequency ranges that are less than FOOB (MHz) in Table 6.5.3.1.3-1 from the edge of the channel bandwidth.

Table 6.5.3.3.5.3-1: Additional requirements for "NS\_18"

|  |  |  |  |
| --- | --- | --- | --- |
| Frequency range  (MHz) | Channel bandwidth / Spectrum emission limit (dBm) | Measurement bandwidth |  |
| 5, 10, 15, 20, 30 MHz |
| 692-698 | -26.2 | 6 MHz |  |

6.5.3.3.5.4 Test requirement (network signalling value “NS\_05” and “NS\_05U”)

When "NS 05" or "NS\_05U" is indicated in the cell,

The measured UE mean power in the channel bandwidth, derived in step 3, shall fulfil requirements in Table 6.2.3.5-6 for power class 3 UE.

The power of any UE emission shall not exceed the levels specified in Table 6.5.3.3.5.4-1. This requirement also applies for the frequency ranges that are less than FOOB (MHz) in Table 6.5.3.1.3-1 from the edge of the channel bandwidth.

Table 6.5.3.3.5.4-1: Additional requirements for "NS\_05" and "NS\_05U"

|  |  |  |  |
| --- | --- | --- | --- |
| Frequency band  (MHz) | Channel bandwidth / Spectrum emission limit (dBm) | Measurement bandwidth |  |
| 5, 10, 15, 20 MHz |
| 1884.5 ≤ f ≤ 1915.7 | -41 | 300 kHz |  |

6.5.3.3.5.5 Test requirement (network signalling value "NS\_43" and "NS\_43U")

When "NS\_43" or "NS\_43U" is indicated in the cell,

The measured UE mean power in the channel bandwidth, derived in step 3, shall fulfil requirements in Table 6.2.3.5-10 for power class 3 UE.

The power of any UE emission shall not exceed the levels specified in Table 6.5.3.3.5.5-1. This requirement also applies for the frequency ranges that are less than FOOB (MHz) in Table 6.5.3.1.3-1 from the edge of the channel bandwidth.

Table 6.5.3.3.5.5-1: Additional requirement for "NS\_43" and "NS\_43U"

|  |  |  |
| --- | --- | --- |
| Frequency range  (MHz) | Channel bandwidth / Spectrum emission limit (dBm) | Measurement bandwidth |
| 5, 10, 15 MHz |
| 860 ≤ f ≤ 890 | -40 | 1 MHz |
| NOTE 1: Applicable for 5 MHz and 15 MHz channel BW confined between 900 MHz and 915 MHz and for 10 MHz channel BW confined between 905 MHz and 915 MHz | | |

6.5.3.3.5.6 Test requirement (network signalling value “NS\_37”)

When "NS\_37" is indicated in the cell,

The measured UE mean power in the channel bandwidth, derived in step 3, shall fulfil requirements in Table 6.2.3.5-14 for power class 3 UE.

The power of any UE emission shall not exceed the levels specified in Table 6.5.3.3.5.6-1. This requirement also applies for the frequency ranges that are less than FOOB (MHz) in Table 6.5.3.1.3-1 from the edge of the channel bandwidth.

Table 6.5.3.3.5.6-1: Additional requirement for "NS\_37"

|  |  |  |
| --- | --- | --- |
| Frequency band  (MHz) | Channel bandwidth (MHz) / Spectrum emission limit (dBm) | Measurement bandwidth |
| 5, 10, 15, 20 |
| 1475.9 ≤ f ≤ 1510.9 | -35 | 1 MHz |

6.5.3.3.5.7 Test requirement (network signalling value “NS\_38”)

TBD

6.5.3.3.5.8 Test requirement (network signalling value “NS\_39”)

TBD

6.5.3.3.5.9 Test requirement (network signalling value “NS\_40”)

TBD

6.5.3.3.5.10 Test requirement (network signalling value “NS\_41”)

When "NS\_41" is indicated in the cell,

The measured UE mean power in the channel bandwidth, derived in step 3, shall fulfil requirements in Table 6.2.3.5-20 for power class 3 UE.

The power of any UE emission shall not exceed the levels specified in Table 6.5.3.3.5.10-1. This requirement also applies for the frequency ranges that are less than FOOB (MHz) in Table 6.5.3.1.3-1 from the edge of the channel bandwidth.

Table 6.5.3.3.5.10-1: Additional requirements for NR channels assigned within 1432-1517 MHz for "NS\_41"

|  |  |  |
| --- | --- | --- |
| **Frequency band**  **(MHz)** | **Channel bandwidth (MHz) /**  **Spectrum emission limit**  **(dBm)** | **Measurement bandwidth** |
| 5, 10, 15, 20, 40, 50, 60 |
| 1400 ≤ f ≤ 1427 | -32 | 27 MHz |
| NOTE 1: This requirement shall be verified with UE transmission power of 15 dBm. | | |

6.5.3.3.5.11 Test requirement (network signalling value “NS\_42”)

When "NS\_42" is indicated in the cell,

The measured UE mean power in the channel bandwidth, derived in step 3, shall fulfil requirements in Table 6.2.3.5-21 for power class 3 UE.

The power of any UE emission shall not exceed the levels specified in Table 6.5.3.3.5.11-1. This requirement also applies for the frequency ranges that are less than FOOB (MHz) in Table 6.5.3.1.3-1 from the edge of the channel bandwidth.

Table 6.5.3.3.5.11-1: Additional requirements for NR channels assigned within 1432-1517MHz for "NS\_42"

|  |  |  |
| --- | --- | --- |
| **Frequency band**  **(MHz)** | **Channel bandwidth (MHz) /**  **Spectrum emission limit**  **(dBm)** | **Measurement bandwidth** |
| 5, 10, 15, 20, 40, 50, 60 |
| 1518 ≤ f ≤ 1520 | -0.8 | 1 MHz |
| 1520 < f ≤ 1559 | -30 | 1 MHz |

6.5.3.3.5.12 Test requirement (network signalling value “NS\_21”)

When "NS\_21" is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 6.5.3.3.5.12-1. These requirements also apply for the frequency ranges that are less than FOOB (MHz) in Table 6.5.3.1.3‑1 from the edge of the channel bandwidth.

Table 6.5.3.3.5.12-1: Additional requirements for "NS\_21"

|  |  |  |
| --- | --- | --- |
| Frequency band  (MHz) | Channel bandwidth (MHz) / Spectrum emission limit (dBm) | Measurement bandwidth |
| 5, 10 |
| 2200 ≤ f < 2288 | -40 | 1 MHz |
| 2288 ≤ f < 2292 | -37 | 1 MHz |
| 2292 ≤ f < 2296 | -31 | 1 MHz |
| 2296 ≤ f < 2300 | -25 | 1 MHz |
| 2320 ≤ f < 2324 | -25 | 1 MHz |
| 2324 ≤ f < 2328 | -31 | 1 MHz |
| 2328 ≤ f < 2332 | -37 | 1 MHz |
| 2332 ≤ f ≤ 2395 | -40 | 1 MHz |

6.5.3.3.5.13 Test requirement (network signalling value “NS\_24”)

When "NS 24" is indicated in the cell,

The measured UE mean power in the channel bandwidth, derived in step 3, shall fulfil requirements in Table 6.2.3.5-17.

The power of any UE emission shall not exceed the levels specified in Table 6.5.3.3.5.13-1. This requirement also applies for the frequency ranges that are less than FOOB (MHz) in Table 6.5.3.1.3-1 from the edge of the channel bandwidth.

Table 6.5.3.3.5.13-1: Additional requirements

|  |  |  |
| --- | --- | --- |
| Frequency band  (MHz) | Channel bandwidth /  Spectrum emission limit  (dBm) | Measurement bandwidth |
| 5 MHz, 10 MHz, 15 MHz, 20 MHz |
| 2010 ≤ f ≤ 2025 | -50 | 1 MHz |
| NOTE 1:This requirement applies at a frequency offset equal or larger than 5 MHz from the upper edge of the channel bandwidth, whenever these frequencies overlap with the specified frequency band. | | |

6.5.3.3.5.14 Test requirement (network signalling value “NS\_27”)

When "NS\_27" is indicated in the cell,

The measured UE mean power in the channel bandwidth, derived in step 3, shall fulfil requirements in Table 6.2.3.5-18 for power class 3 UE.

The power of any UE emission shall not exceed the levels specified in Table 6.5.3.3.5.14-1. This requirement also applies for the frequency ranges that are less than FOOB (MHz) in Table 6.5.3.1.3-1 from the edge of the channel bandwidth.

Table 6.5.3.3.5.14-1: Additional requirement for "NS\_27"

|  |  |  |
| --- | --- | --- |
| Frequency range  (MHz) | Channel bandwidth (MHz) / Spectrum emission limit (dBm) | Measurement bandwidth |
| 5, 10, 15, 20, 30, 40 |
| 9 kHz – 3530 MHz | -40 | 1 MHz |
| 3530 MHz – 3540 MHz | -25 |
| 3710 MHz – 3720 MHz | -25 |
| 3720 MHz – 12.75 GHz | -40 |

6.5.3.3.5.15 Test requirement (network signalling value “NS\_47”)

When "NS 47" is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 6.5.3.3.5.15-1. This requirement also applies for the frequency ranges that are less than FOOB (MHz) in Table 6.5.3.1.3-1 from the edge of the channel bandwidth.

Table 6.5.3.3.5.15-1: Additional requirement for "NS\_47"

|  |  |  |
| --- | --- | --- |
| Frequency band  (MHz) | Channel bandwidth (MHz) /  Spectrum emission limit  (dBm) | Measurement bandwidth |
| 30 |
| 2530 ≤ f ≤ 2535 | -25 | 1 MHz |
| 2505 ≤ f ≤ 2530 | -30 | 1 MHz |

6.5.3.3.5.16 Test requirement (network signalling value “NS\_50”)

When "NS\_50" is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 6.5.3.3.5.16-1. This requirement also applies for the frequency ranges that are less than FOOB (MHz) in Table 6.5.3.1.3-1 from the edge of the channel bandwidth.

Table 6.5.3.3.5.16-1: Additional requirements for "NS\_50"

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Protected band | Frequency range (MHz) | | | Maximum Level (dBm) | MBW (MHz) | NOTE |
| Frequency range | 1805 | - | 1855 | -40 | 1 | 1 |
| Frequency range | 1855 | - | 1880 | -15.5 | 5 | 1, 2, 3 |
| NOTE 1: This requirement is applicable for carriers with aggregated channel bandwidths confined in 1885-1920 MHz for ≤ 30MHz channel BWs and confined in 1880-1920 MHz for 40MHz channel BW.  NOTE 2: The requirement also applies for the frequency ranges that are less than FOOB (MHz) in Table 6.5.3.1.3-1 from the edge of the channel bandwidth.  NOTE 3: For these adjacent bands, the emission limit could imply risk of harmful interference to UE(s) operating in the protected operating band. | | | | | | |

6.5.3.3.5.17 Test requirement (network signalling value “NS\_12”)

Table 6.5.3.3.5.17-1: Additional requirements for “NS\_12”

|  |  |  |
| --- | --- | --- |
| Frequency band  (MHz) | Channel bandwidth /  Spectrum emission limit  (dBm) | Measurement bandwidth |
| 5 MHz, 10 MHz |
| 806 ≤ f ≤ 813.5 | -42 | 6.25 kHz |
| NOTE 1: The requirement applies for E-UTRA carriers with lower channel edge at or above 814 MHz.  NOTE 2: The emissions measurement shall be sufficiently power averaged to ensure a standard deviation < 0.5 dB. | | |

6.5.3.3.5.18 Test requirement (network signalling value “NS\_13”)

Table 6.5.3.3.5.18-1: Additional requirements for “NS\_13”

|  |  |  |
| --- | --- | --- |
| Frequency band  (MHz) | Channel bandwidth /  Spectrum emission limit  (dBm) | Measurement bandwidth |
| 5 MHz |
| 806 ≤ f ≤ 816 | -42 | 6.25 kHz |
| NOTE 1: The requirement applies for E-UTRA carriers with lower channel edge at or above 817 MHz.  NOTE 2: The emissions measurement shall be sufficiently power averaged to ensure a standard deviation < 0.5 dB. | | |

6.5.3.3.5.19 Test requirement (network signalling value “NS\_14”)

Table 6.5.3.3.5.19-1: Additional requirements for “NS\_14”

|  |  |  |
| --- | --- | --- |
| Frequency band  (MHz) | Channel bandwidth /  Spectrum emission limit  (dBm) | Measurement bandwidth |
| 10 MHz, 15 MHz, 20MHz |
| 806 ≤ f ≤ 816 | -42 | 6.25 kHz |
| NOTE 1: The requirement applies for E-UTRA carriers with lower channel edge at or above 817 MHz.  NOTE 2: The emissions measurement shall be sufficiently power averaged to ensure a standard deviation < 0.5 dB. | | |

6.5.3.3.5.20 Test requirement (network signalling value “NS\_15”)

Table 6.5.3.3.5.20-1: Additional requirements for “NS\_15”

|  |  |  |
| --- | --- | --- |
| Frequency band  (MHz) | Channel bandwidth /  Spectrum emission limit  (dBm) | Measurement bandwidth |
| 5 MHz, 10 MHz, 15 MHz, 20 MHz |
| 851 ≤ f ≤ 859 | -53 | 6.25 kHz |
| NOTE 1: The emissions measurement shall be sufficiently power averaged to ensure a standard deviation < 0.5 dB. | | |

6.5.3.3.5.21 Test requirement (network signalling value “NS\_45”)

When "NS 45" is indicated in the cell,

The measured UE mean power in the channel bandwidth, derived in step 3, shall fulfil requirements in Table 6.2.3.5-29.

The power of any UE emission shall not exceed the levels specified in Table 6.5.3.3.5.21-1. This requirement also applies for the frequency ranges that are less than FOOB (MHz) in Table 6.5.3.1.3-1 from the edge of the channel bandwidth.

Table 6.5.3.3.5.21-1: Additional requirements

|  |  |  |  |
| --- | --- | --- | --- |
| Frequency band  (MHz) | Channel bandwidth / Spectrum emission limit (dBm) | | Measurement bandwidth |
| 5 MHz | 10 MHz |
| 0.009 < f ≤ 2473.5 | -25 | -25 | 1 MHz |
| 2473.5 < f ≤ 2477.5 | -25 | -13 | 1 MHz |
| 2477.5 < f ≤ 2478.5 | -13 | -13 | 1 MHz |
| 2478.5< f ≤ 2483.5 | -10 | -10 | 1 MHz |
| 2495 ≤ f < 2496 | -13 | -13 | 1% of Channel Bandwidth |
| 2496 ≤ f < 2501 | -13 | -13 | 1 MHz |
| 2501 < f ≤ 2505 | -25 | -13 | 1 MHz |
| 2505 ≤ f ≤ 5th harmonic of the upper frequency edge of the UL operating band | -25 | -25 | 1 MHz |

6.5.3.3.5.22 Test requirement (network signalling value “NS\_48”)

When "NS 48" is indicated in the cell,

The measured UE mean power in the channel bandwidth, derived in step 3, shall fulfil requirements in Table 6.2.3.5-24.

The power of any UE emission shall not exceed the levels specified in Table 6.5.3.3.5.22-1. This requirement also applies for the frequency ranges that are less than FOOB (MHz) in Table 6.5.3.1.3-1 from the edge of the channel bandwidth.

Table 6.5.3.3.5.22-1: Additional requirements

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Protected band | Frequency range (MHz) | | | Maximum Level (dBm) | MBW (MHz) | NOTE |
| E-UTRA band 34 –  NR band n34 | FDL\_low | - | FDL\_high | -50 | 1 |  |
| Frequency range | 1900 | - | 1915 | -15.5 | 5 | 1 |
| Frequency range | 1915 | - | 1920 | +1.6 | 5 | 1 |
| NOTE 1: For these adjacent bands, the emission limit could imply risk of harmful interference to UE(s) operating in the protected operating band. | | | | | | |

6.5.3.3.5.23 Test requirement (network signalling value “NS\_49”)

When "NS 49" is indicated in the cell,

The measured UE mean power in the channel bandwidth, derived in step 3, shall fulfil requirements in Table 6.2.3.5-33 for PC3 or Table 6.2.3.5-33a for PC2.

The power of any UE emission shall not exceed the levels specified in Table 6.5.3.3.5.23-1. This requirement also applies for the frequency ranges that are less than FOOB (MHz) in Table 6.5.3.1.3-1 from the edge of the channel bandwidth.

Table 6.5.3.3.5.23-1: Additional requirements

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Protected band | Frequency range (MHz) | | | Maximum Level (dBm) | MBW (MHz) | NOTE |
| E-UTRA band 34 -  NR band n34 | FDL\_low | - | FDL\_high | -50 | 1 |  |
| Frequency range | 1880 | - | 1895 | -40 | 1 |  |
| Frequency range | 1895 |  | 1915 | -15.5 | 5 | 1 |
| Frequency range | 1915 | - | 1920 | 1.6 | 5 | 1 |
| NOTE 1: For these adjacent bands, the emission limit could imply risk of harmful interference to UE(s) operating in the protected operating band. | | | | | | |

6.5.3.3.5.24 Test requirement (network signalling value “NS\_44”)

When "NS 44" is indicated in the cell,

The measured UE mean power in the channel bandwidth, derived in step 3, shall fulfil requirements in Table 6.2.3.5-31.

The power of any UE emission shall not exceed the levels specified in Table 6.5.3.3.5.24-1. This requirement also applies for the frequency ranges that are less than FOOB (MHz) in Table 6.5.3.1.3-1 from the edge of the channel bandwidth.

Table 6.5.3.3.5.24-1: Additional requirements

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Protected band | Frequency range (MHz) | | | Maximum Level (dBm) | MBW (MHz) | NOTE |
| Frequency range | 2620 | - | 2645 | -15.5 | 5 | 1, 2 |
| Frequency range | 2645 | - | 2690 | -40 | 1 | 1 |
| NOTE 1: This requirement is applicable for carriers confined in 2570-2615 MHz.  NOTE 2: For these adjacent bands, the emission limit could imply risk of harmful interference to UE(s) operating in the protected operating band. | | | | | | |

6.5.3.3.5.25 Test requirement (network signalling value “NS\_46”)

When "NS\_46" is indicated in the cell, the measured UE mean power in the channel bandwidth, derived in step 3, shall fulfil requirements in Table 6.2.3.5-30. The power of any UE emission shall not exceed the levels specified in Table 6.5.3.3.5.25-1. This requirement also applies for the frequency ranges that are less than FOOB (MHz) in Table 6.5.3.1.3-1 from the edge of the channel bandwidth.

Table 6.5.3.3.25-1: Additional requirements for “NS\_46”

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Protected band | Frequency range (MHz) | | | Maximum Level (dBm) | MBW (MHz) | NOTE |
| Frequency range | 2570 | - | 2575 | +1.6 | 5 | 1, 2 |
| Frequency range | 2575 | - | 2595 | -15.5 | 5 | 1, 2 |
| Frequency range | 2595 | - | 2620 | -40 | 1 | 1 |
| NOTE 1: This requirement is applicable for all carriers confined in 2500-2570 MHz. Sepcial restrictions apply for channel bandwidths up to 20MHz: For carriers of 15 MHz bandwidth when carrier centre frequency is within the range 2560.5 - 2562.5 MHz and for carriers of 20 MHz bandwidth when carrier centre frequency is within the range 2552 - 2560 MHz the requirement is applicable only for an uplink transmission bandwidth less than or equal to 54 RB with the minimum supported SCS of 15KHz.  NOTE 2: For these adjacent bands, the emission limit could imply risk of harmful interference to UE(s) operating in the protected operating band. | | | | | | |

6.5.3.3.5.26 Test requirement (network signalling value “NS\_07”)

When "NS\_07" is indicated in the cell, the measured UE mean power in the channel bandwidth, derived in step 3, shall fulfil requirements in Table 6.2.3.5-37. The power of any UE emission shall not exceed the levels specified in Table 6.5.3.3.5.26-1. This requirement also applies for the frequency ranges that are less than FOOB (MHz) in Table 6.5.3.1.3-1 from the edge of the channel bandwidth.

Table 6.5.3.3.26-1: Additional requirements for “NS\_07”

|  |  |  |
| --- | --- | --- |
| Frequency band  (MHz) | Channel bandwidth / Spectrum emission limit (dBm) | Measurement bandwidth |
| 10 MHz |
| 769 ≤ f ≤ 775 | -57 | 6.25 kHz |
| NOTE: The emissions measurement shall be sufficiently power averaged to ensure standard standard deviation < 0.5 dB. | | |

6.5.3.3.5.27 Test requirement (network signalling value “NS\_56”)

When "NS 56" is indicated in the cell,

The measured UE mean power in the channel bandwidth, derived in step 3, shall fulfil requirements in Table 6.2.3.5-36.

The power of any UE emission shall not exceed the levels specified in Table 6.5.3.3.5.27-1. This requirement also applies for the frequency ranges that are less than FOOB (MHz) in Table 6.5.3.1.3-1 from the edge of the channel bandwidth.

Table 6.5.3.3.5.27-1: Additional requirements

|  |  |  |  |
| --- | --- | --- | --- |
| Frequency band  (MHz) | Channel bandwidth / Spectrum emission limit1 (dBm) | Measurement bandwidth | NOTE |
| 5 MHz, 10MHz |
| 1541 ≤ f ≤ 1559 | -102 | 2kHz | Averaged over any 2millisecond active transmission interval |
| 1559≤ f ≤ 1608 | -85 | 700Hz |  |
| 1608≤ f ≤ 1610 | -85 +5/2 (f-1608) | 700Hz |  |
| 1610≤ f ≤ 1625 | -80+ 66/15 (f-1610) | 700Hz |  |
| 1541 ≤ f ≤ 1608 | -75 | 1MHz | Averaged over any 2millisecond active transmission interval |
| 1608≤ f ≤ 1610 | -75 + 5/2 (f-1608) | 1MHz |  |
| 1610≤ f ≤ 1627.5 | -70+ 57/17.5 (f-1610) | 1MHz |  |
| 1627.5 | -37 | 4kHz |  |
| 1638.5 ≤f ≤ 1645.5 | -28 | 4kHz |  |
| 1657.5 ≤f ≤ 1660.5 | -28 | 4kHz |  |
| NOTE 1: The EIRP requirement in regulation is converted to conducted requirement using a 0 dBi antenna. | | | |

### 6.5.4 Transmit intermodulation

6.5.4.1 Test purpose

To verify that the UE transmit intermodulation does not exceed the described value in the test requirement.

The transmit intermodulation performance 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 wanted signal and an interfering signal reaching the transmitter via the antenna.

6.5.4.2 Test applicability

This test case applies to all types of NR Power Class 1 release 15 and forward.

This test case applies to all types of NR Power Class 2 and Power Class 3 UE release 15 and forward that don’t support Tx diversity.

6.5.4.3 Minimum conformance requirements

UE transmit intermodulation is defined by the ratio of the mean power of the wanted signal to the mean power of the intermodulation product when an interfering CW signal is added at a level below the wanted signal at each transmitter antenna port with the other antenna port(s) if any terminated. Both the wanted signal power and the intermodulation product power are measured through NR rectangular filter with measurement bandwidth shown in Table 6.5.4.3-1.

The requirement of transmit intermodulation is specified in Table 6.5.4.3-1.

Table 6.5.4.3-1: Transmit Intermodulation

|  |  |  |
| --- | --- | --- |
| Wanted signal  channel bandwidth | BWChannel | |
| Interference signal  frequency offset from channel centre | BWChannel | 2\*BWChannel |
| Interference CW signal level | -40dBc | |
| Intermodulation product | < -29dBc | < -35dBc |
| Measurement bandwidth | The maximum transmission bandwidth configuration among the different SCSs for the channel BW as defined in Table 6.5.2.4.1.3-1 | |
| Measurement offset from channel centre | BWChannel and 2\*BWChannel | 2\*BWChannel and 4\*BWChannel |

The normative reference for this requirement is TS 38.101-1 [2] clause 6.5.4.

6.5.4.4 Test description

6.5.4.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, test channel bandwidths and sub-carrier spacing based on NR operating bands specified in table 5.3.5-1. All of these configurations shall be tested with applicable test parameters for each combination of channel bandwidth and sub-carrier spacing, and are shown in table 6.5.4.4.1-1. The details of the uplink reference measurement channels (RMCs) are specified in Annexes A.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Table 6.5.4.4.1-1: Test Configuration Table

|  |  |  |  |
| --- | --- | --- | --- |
| Initial Conditions | | | |
| Test Environment as specified in TS 38.508-1 [5] subclause 4.1 | | Normal | |
| Test Frequencies as specified in TS 38.508-1 [5] subclause 4.3.1 | | Mid range (NOTE 2) | |
| Test Channel Bandwidths as specified in TS 38.508-1 [5] subclause 4.3.1 | | Mid, Highest | |
| Test SCS as specified in Table 5.3.5-1 | | Lowest, Highest | |
| Test Parameters | | | |
| Test ID | Downlink Configuration | Uplink Configuration | |
|  | N/A for transmit intermodulation test case | Modulation | RB allocation (NOTE 1) |
| 1 | DFT-s-OFDM PI/2 BPSK | Inner Full |
| 2 | DFT-s-OFDM QPSK | Inner Full |
| NOTE 1: The specific configuration of each RB allocation is defined in Table 6.1-1.  NOTE 2: For NR band n28, 30MHz test channel bandwidth is tested with Low range test frequencies. | | | |

1. Connect the SS to the UE antenna connectors as shown in TS 38.508-1 [5] Annex A, in Figure A.3.1.3.1 for TE diagram and section A.3.2 for UE diagram.

2. The parameter settings for the cell are set up according to TS 38.508-1 [5] subclause 4.4.3.

3. Downlink signals are initially set up according to Annex C.0, C.1, C.2, and uplink signals according to Annex G.0, G.1, G.2, G.3.0.

4. The UL Reference Measurement channels are set according to Table 6.5.4.4.1-1.

5. Propagation conditions are set according to Annex B.0.

6. Ensure the UE is in State RRC\_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On,* Test Mode *On* and Test Loop Function *On* according to TS 38.508-1 [5] clause 4.5. Message contents are defined in clause 6.5.4.4.3.

6.5.4.4.2 Test procedure

1. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0\_1 for C\_RNTI to schedule the UL RMC according to Table 6.5.4.4.1-1. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC.

2. Send continuously uplink power control "up" commands to the UE until the UE transmits at its PUMAX level.

3. Measure the rectangular filtered mean power of the UE. For TDD, only slots consisting of only UL symbols are under test for the wanted signal and for the intermodulation product.

4. Set the interference signal frequency below the UL carrier frequency using the first offset in table 6.5.4.5-1.

5. Set the interference CW signal level according to table 6.5.4.5-1.

6. Search the intermodulation product signals below and above the UL carrier frequency, then measure the rectangular filtered mean power of transmitting intermodulation for both signals, and calculate the ratios with the power measured in step 3.

7. Set the interference signal frequency above the UL carrier frequency using the first offset in table 6.5.4.5-1.

8. Search the intermodulation product signals below and above the UL carrier frequency, then measure the rectangular filtered mean power of transmitting intermodulation for both signals, and calculate the ratios with the power measured in step 3.

9. Repeat the measurement using the second offset in table 6.5.4.5-1.

6.5.4.4.3 Message contents

Message contents are according to TS 38.508-1 [5] subclause 4.6 with the following exception:

Table 6.5.4.4.3-1: *PUSCH-Config*

|  |
| --- |
| Derivation Path: TS 38.508-1 [5], Table 4.6.3-118 with condition TRANSFORM\_PRECODER\_ENABLED |

6.5.4.5 Test requirement

The ratio derived in step 6 and 8, shall not exceed the described value in table 6.5.4.5-1.

Table 6.5.4.5-1: Transmit Intermodulation

|  |  |  |
| --- | --- | --- |
| Wanted signal  channel bandwidth | BWChannel | |
| Interference signal  frequency offset from channel centre | BWChannel | 2\*BWChannel |
| Interference CW signal level | -40dBc | |
| Intermodulation product | < -29dBc | < -35dBc |
| Measurement bandwidth | The maximum transmission bandwidth configuration among the different SCSs for the channel BW as defined in Table 6.5.2.4.1.5-1 | |
| Measurement offset from channel centre | BWChannel and 2\*BWChannel | 2\*BWChannel and 4\*BWChannel |
| Note 1: The test requirements do not apply when the interfering signal overlaps with the channel bandwidth of the downlink signal. | | |

## 6.5A Output RF spectrum emissions for CA

### 6.5A.1 Occupied bandwidth for CA

#### 6.5A.1.0 Minimum conformance requirements

##### 6.5A.1.0.1 Void

##### 6.5A.1.0.1a Occupied bandwidth for Intra-band contiguous CA

For intra-band contiguous carrier aggregation the occupied bandwidth is a measure of the bandwidth containing 99 % of the total integrated power of the transmitted spectrum. The OBW shall be less than the aggregated channel bandwidth defined in subclause 5.3A.3.

##### 6.5A.1.0.2 Occupied bandwidth for Intra-band non-contiguous CA

For intra-band non-contiguous carrier aggregation, the OBW requirement is met when the ratio of the transmitted power in all sub-blocks of the uplink CA configuration to the total integrated power of the transmitted spectrum is greater than 99%.

##### 6.5A.1.0.3 Occupied bandwidth for Inter-band CA

For inter-band carrier aggregation with uplink assigned to two NR bands, the occupied bandwidth is defined per component carrier. Occupied bandwidth is the bandwidth containing 99 % of the total integrated mean power of the transmitted spectrum on assigned channel bandwidth on the component carrier. The occupied bandwidth shall be less than the channel bandwidth specified in Table 6.5.1.3-1.

#### 6.5A.1.1 Occupied bandwidth for CA (2UL CA)

Editor’s Note:

- Due to lack of MPR requirements in core specification, this test case is incomplete for intra-band contiguous UL CA for power class 2 UEs indicating IE dualPA-Architecture supported, and incomplete for intra-band non-contiguous UL CA for power class 2 UEs, and power class 3 UEs when signalling is absent for dualPA-Architecture.

- MU needs to be reassessed.

6.5A.1.1.1 Test purpose

To verify that the UE occupied bandwidth for all transmission bandwidth configurations supported by the UE are less than their specific limits for 2 UL CA

6.5A.1.1.2 Test applicability

This test case applies to all types of NR UE release 15 and forward that supports 2UL CA

6.5A.1.1.3 Minimum conformance requirements

The minimum conformance requirements are defined in subclause 6.5A.1.0.

6.5A.1.1.4 Test description

6.5A.1.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, test channel bandwidths and sub-carrier spacing based on NR CA configuration specified in clause 5.5A. All of these configurations shall be tested with applicable test parameters for each CA configuration, are shown in Table 6.5A.1.1.4.1-1 for inter-band UL CA, table 6.5A.1.1.4.1-2 for intra-band contiguous CA and table 6.5A.1.1.4.1-3 for intra-band non-contiguous CA. The details of the uplink reference measurement channels (RMCs) are specified in Annexes A.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Table 6.5A.1.1.4.1-1: Inter band CA Test Configuration Table

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Initial Conditions | | | | |
| Test Environment as specified in TS 38.508-1 [5] subclause 4.1 | | Normal | | |
| Test Frequencies as specified in TS 38.508-1 [5] subclause 4.3.1 | | Mid range for both PCC and SCC (NOTE 4) | | |
| Test Channel Bandwidths as specified in TS 38.508-1 [5] subclause 4.3.1 | | Lowest NRB\_agg for both PCC and SCC  Highest NRB\_agg for both PCC and SCC | | |
| Test SCS as specified in Table 5.3.5-1 | | Smallest supported SCS per Channel Bandwidth | | |
| Test Parameters | | | | |
| Test ID | Downlink Configuration for PCC & SCC | Uplink Configuration | | |
|  |  | Modulation for all CCs | RB allocation (NOTE 1) | |
|  |  | (NOTE 2) | PCC | SCC |
| 1 | N/A for this test | CP-OFDM QPSK | Outer\_Full | Outer\_Full |
| NOTE 1: The specific configuration of each RB allocation is defined in Table 6.1-1.  NOTE 2: CA Configuration Test CC Combination settings are checked separately for each CA Configuration, which applicable aggregated channel bandwidths are specified in Table 5.3A.4-1.  NOTE 3: Test Channel Bandwidths and Test SCS are checked separately for each NR CA band combination, which applicable channel bandwidths is specified in Table 5.5A.3.1-1 and SCS is specified in Table 5.3.5-1 for each NR band.  NOTE 4: For NR band n28, 30MHz test channel bandwidth is tested with Low range test frequencies. | | | | |

Table 6.5A.1.1.4.1-2: Intra band contiguous CA Test Configuration Table

|  |  |  |  |
| --- | --- | --- | --- |
| Initial Conditions | | | |
| Test Environment as specified in TS 38.508-1 [5] subclause 4.1 | | Normal | |
| Test Frequencies as specified in TS 38.508-1 [5] subclause 4.3.1 | | Mid range | |
| Test Channel Bandwidths as specified in TS 38.508-1 [5] subclause 4.3.1 | | All aggregated channel bandwidth | |
| Test SCS as specified in Table 5.3.5-1 | | Smallest supported SCS per Channel Bandwidth | |
| Test Parameters | | | |
| Test ID | Downlink Configuration for PCC & SCC | Uplink Configuration | |
|  |  | Modulation for all CCs | RB allocation (NOTE 1) |
|  |  | (NOTE 2) |
| 1 | N/A for this test | CP-OFDM QPSK | Outer\_Full |
| NOTE 1: The specific configuration of each RB allocation is defined in Table 6.1A-1a.  NOTE 2: CA Configuration Test CC Combination settings are checked separately for each CA Configuration, which applicable aggregated channel bandwidths are specified in Table 5.5A.1-1.  NOTE 3: If the UE supports multiple CC Combinations in the CA Configuration with the same NRB\_agg, only the combination with the highest NRB\_PCC is tested. | | | |

Table 6.5A.1.1.4.1-3: Intra band non-contiguous CA Test Configuration Table

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Initial Conditions | | | | | | | | | |
| Test Environment as specified in TS 38.508-1 [5] subclause 4.1 | | | | | | Normal | | | |
| Test Frequencies as specified in TS 38.508-1 [5] subclause 4.3.1 | | | | | | Low range and High range test frequencies as specified in tables for non-contiguous CA configuration with UL CA | | | |
| Test Channel Bandwidths as specified in TS 38.508-1 [5] subclause 4.3.1 | | | | | | All aggregated channel bandwidth | | | |
| Test SCS as specified in Table 5.3.5-1 | | | | | | Smallest supported SCS per Channel Bandwidth | | | |
| Test Parameters | | | | | | | | | |
| ID | CA config | | | | | DL config | UL config | | |
| PCC | | SCC | | Wgap | CC MOD | RB allocation (NOTE 1) | |
| Band | Range | Band | Range | PCC | SCC |
| 1 | nX | CC1 | nX | CC2 | Max (NOTE 4) | N/A | CP-OFDM QPSK | Outer\_Full | Outer\_Full |
| NOTE 1: The RB allocation is defined in table 6.1-1 for each CC.  NOTE 2: Test Channel Bandwidths and Test SCS are checked separately for each NR CA band combination, which applicable channel bandwidths and SCS are specified in Table 5.5A.2-1.  NOTE 3: If the UE supports multiple CC Combinations in the CA Configuration with the same NRB\_agg, only the combination with the highest NRB\_PCC is tested.  NOTE 4: The Wgap is defined to be widest possible on band based on the PCC and SCC configuration | | | | | | | | | |

1. Connect the SS to the UE antenna connectors as shown in TS 38.508-1 [5] Annex A, in Figure A.3.1.1.3 for TE diagram and section A.3.2.1 for UE diagram.

2. The parameter settings for the cell are set up according to TS 38.508-1 [5] subclause 4.4.3.

3. Downlink signals for PCC are initially set up according to Annex C.0, C.1 and C.2, and uplink signals according to Annex G.0, G.1, G.2, G.3.0.

4. The UL Reference Measurement channels are set according to Table 6.5A.1.1.4.1-1 to Table 6.5A.1.1.4.1-3.

5. Propagation conditions are set according to Annex B.0.

6. Ensure the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On*, Test Mode *On* and Test Loop Function *On* according to TS 38.508-1 [5] clause 4.5. Message contents are defined in clause 6.5A.1.1.4.3.

6.5A.1.1.4.2 Test procedure

1. Configure SCC according to Annex C.0, C.1, C.2 for all downlink physical channels.

2. The SS shall configure SCC as per TS 38.508-1 [5] clause 5.5.1. Message contents are defined in clause 6.5A.1.1.4.3.

3. SS activates SCC by sending the activation MAC CE (Refer TS 38.321 [18], clauses 5.9, 6.1.3.10). Wait for at least 2 seconds (Refer TS 38.133[19], clause9.3).

4. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0\_1 for C\_RNTI to schedule the UL RMC according to Table 6.5A.1.1.4.1-1 or Table 6.5A.1.1.4.1-2 as appropriate. Since the UL has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC.

5. Send continuously power control “up” commands to the UE until the UE transmits at PUMAX level. Allow at least 200ms for the UE to reach PUMAX level.

6. **For inter-band CA:** measure the power spectrum distribution of both PCC and SCC within two times or more range over the requirement for Occupied Bandwidth specification centring on the current carrier frequency.

**For Intra-band contiguous CA:** measure the power spectrum distribution over all component carriers within two times or more range over the aggregated channel bandwidth requirement for Occupied Bandwidth specification centring on the centre of aggregated channel bandwidth. The characteristics of the filter shall be approximately Gaussian (typical spectrum analyser filter). Other methods to measure the power spectrum distribution are allowed. The measuring duration is at least 1ms over consecutive active uplink slots.

**For intra-band non-contiguous CA:** measure the power spectrum distribution of each sub-block over all component carriers within the requirement for Occupied Bandwidth for CA specification, centring on the carrier frequency of each sub-block in CA configuration. The characteristic of the filter shall be approximately Gaussian (typical spectrum analyzer filter). Other methods to measure the power spectrum distribution are allowed. The measuring duration is one active uplink subframe. For TDD slots with transient periods are not under test.

7. Calculate the total power within the range of all frequencies measured in step 6 and save this value as “Total power”. “Total power” is calculated for each CC separately for inter-band carrier aggregation, and for all CCs together for intra-band contiguous and non-contiguous carrier aggregation.

8. Identify the measurement window whose centre is aligned on the centre of the channel bandwidth on each carrier for inter-band carrier aggregation, or on the centre of the aggregated channel bandwidth for intra-band contiguous carrier aggregation or centring on each carrier frequency of each sub-block for which the sum of the power measured is 99% of the “Total power”.

9. The “Occupied Bandwidth” is the width of the measurement window obtained in step 8.

6.5A.1.1.4.3 Message contents

Message contents are according to TS 38.508-1 [5] subclause 4.6 with following exception.

Table 6.5A.1.1.4.3-1: FrequencyInfoUL-SIB for inter-band CA

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [5] Table 4.6.3-62 FrequencyInfoUL-SIB | | | |
| Information Element | Value/remark | Comment | Condition |
| p-Max | 20 |  | Power class 3 and Inter-band CA |

Table 6.5A.1.1.4.3-2: FrequencyInfoUL-SIB for intra-band contiguous CA (contiguous RB allocation)

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [5] Table 4.6.3-62 FrequencyInfoUL-SIB | | | |
| Information Element | Value/remark | Comment | Condition |
| p-Max | 15 |  | Power class 3 and Bandwidth class B |
|  | 10 |  | Power class 3 and Bandwidth class C |

6.5A.1.1.5 Test requirements

For inter-band carrier aggregation, the measured Occupied Bandwidth for each component carrier shall not exceed values in Table 6.5.1.5-1.

Table 6.5A.1.1.5-1: Void

For intra-band contiguous carrier aggregation, the measured Occupied Bandwidth shall not exceed the aggregated channel bandwidth as defined in subclause 5.3A.3.

For intra-band non-contiguous carrier aggregation, the measured Occupied Bandwidth shall not exceed values of channel bandwidth as defined in section 5.5A.2.

### 6.5A.2 Out of band emission for CA

#### 6.5A.2.1 General

This clause contains requirements for out of band emissions for UE configured of carrier aggregation.

#### 6.5A.2.2 Spectrum emission mask

Editor’s note: The following aspects are either missing or not yet determined:

- This test case in incomplete when signalling is absent for dualPA-Architecture IE due to lack of core requirements.

##### 6.5A.2.2.0 Minimum conformance requirements

For intra-band contiguous carrier aggregation the spectrum emission mask of the UE applies to frequencies (ΔfOOB) starting from the ± edge of the aggregated channel bandwidth. For intra-band contiguous carrier aggregation, the power of any UE emission shall not exceed the levels specified in Table 6.5A.2.2.0-1 for the specified channel bandwidth.

For power class 2 intra-band contiguous carrier aggregation, the spectrum emission mask is measured as the sum from both UE transmit antenna connectors when UE indicates support for *dualPA-Architecture* IE.

Table 6.5A.2.2.0-1: General NR CA spectrum emission mask

|  |  |  |
| --- | --- | --- |
| ΔfOOB  (MHz) | Spectrum emission limit(dBm) | MBW(MHz) |
| ± 0 - 1 | -13 | Min(0.01\*BWchannel\_CA, 0.4) |
| ± 1 - 5 | -10 | 1MHz |
| ± 5 – BWchannel\_CA | -13 | 1MHz |
| ±BWchannel\_CA- BWchannel\_CA+5 | -25 | 1MHz |

For intra-band non-contiguous carrier aggregation the spectrum emission mask requirement is defined as a composite spectrum emissions mask. Composite spectrum emission mask applies to frequencies up to ΔfOOB starting from the edges of the sub-blocks. Composite spectrum emission mask is defined as follows:

a) Composite spectrum emission mask is a combination of individual sub-block spectrum emissions masks

b) In case the sub-block consist of one component carrier the sub-lock general spectrum emission mask is defined in subclause 6.5.2.2

c) If for some frequency sub-block spectrum emission masks overlap then spectrum emission mask allowing higher power spectral density applies for that frequency

d) If for some frequency a sub-block spectrum emission mask overlaps with the sub-block bandwidth of another sub-block, then the emission mask does not apply for that frequency.

When signalling for dualPA-Architecture IE is absent, carrier leakage or I/Q image may land inside the gap spectrum between 2 UL CCs when UL CCs are synchronized with frequencies in the gap.

For inter-band carrier aggregation with uplink assigned to two NR bands, the minimum conformance requirements specified in subclause 6.5.2.2 shall apply on each component carrier with all component carriers active. If for some frequency spectrum emission masks of component carriers overlap then spectrum emission mask allowing higher power spectral density applies for that frequency. If for some frequency a component carrier spectrum emission mask overlaps with the channel bandwidth of another component carrier, then the emission mask does not apply for that frequency.

##### 6.5A.2.2.1 Spectrum emission mask for CA (2UL CA)

6.5A.2.2.1.1 Test purpose

To verify that the power of any UE emission shall not exceed specified level for the specified channel bandwidth for 2UL CA.

6.5A.2.2.1.2 Test applicability

This test case applies to all types of NR UE release 15 and forward that supports 2UL CA.

6.5A.2.2.1.3 Minimum conformance requirements

The minimum conformance requirements are defined in subclause6.5A.2.2.0.

6.5A.2.2.1.4 Test description

6.5A.2.2.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, test channel bandwidths and sub-carrier spacing based on NR CA configuration specified in clause 5.5A. All of these configurations shall be tested with applicable test parameters for each CA configuration, are shown in Tables 6.5A.2.2.1.4.1-1 through 6.5A.2.2.1.4.1-3. The details of the uplink reference measurement channels (RMCs) are specified in Annexes A.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Table 6.5A.2.2.1.4.1-1: Inter band CA Test Configuration Table

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Initial Conditions | | | | | |
| Test Environment as specified in TS 38.508-1 [5] subclause 4.1 | | | Normal | | |
| Test Frequencies as specified in TS 38.508-1 [5] subclause4.3.1.1.3 for inter band CA in FR1 | | | Low range for PCC and SCC  High range for PCC and SCC | | |
| Test Channel Bandwidths as specified in TS 38.508-1 [5] subclause 4.3.1 | | | Lowest NRB\_agg for both PCC and SCC  Highest NRB\_agg for both PCC and SCC | | |
| Test SCS as specified in Table 5.3.5-1 | | | Smallest and biggest supported SCS per Channel Bandwidth | | |
| Test Parameters | | | | | |
| Test ID | Freq | Downlink Configuration | Uplink Configuration | | |
| Modulation | RB allocation (NOTE 1) | |
| PCC | SCC |
| 13 | Low | N/A | DFT-s-OFDM PI/2 BPSK | Edge\_1RB\_Left | Edge\_1RB\_Left |
| 23 | High | DFT-s-OFDM PI/2 BPSK | Edge\_1RB\_Right | Edge\_1RB\_Right |
| 3 | Low | DFT-s-OFDM QPSK | Edge\_1RB\_Left | Edge\_1RB\_Left |
| 4 | High | DFT-s-OFDM QPSK | Edge\_1RB\_Right | Edge\_1RB\_Right |
| 5 | Low | DFT-s-OFDM 16 QAM | Edge\_1RB\_Left | Edge\_1RB\_Left |
| 6 | High | DFT-s-OFDM 16 QAM | Edge\_1RB\_Right | Edge\_1RB\_Right |
| 7 | Default | DFT-s-OFDM 64 QAM | Outer\_Full | Outer\_Full |
| 8 | Default | DFT-s-OFDM 256 QAM | Outer\_Full | Outer\_Full |
| 9 | Low | CP-OFDM QPSK | Edge\_1RB\_Left | Edge\_1RB\_Left |
| 10 | High | CP-OFDM QPSK | Edge\_1RB\_Right | Edge\_1RB\_Right |
| 11 | Low | CP-OFDM 16 QAM | Edge\_1RB\_Left | Edge\_1RB\_Left |
| 12 | High | CP-OFDM 16 QAM | Edge\_1RB\_Right | Edge\_1RB\_Right |
| 13 | Default | CP-OFDM 64 QAM | Outer\_Full | Outer\_Full |
| 14 | Default | CP-OFDM 256 QAM | Outer\_Full | Outer\_Full |
| NOTE 1: The specific configuration of each RB allocation is defined in Table 6.1-1.  NOTE 2: Test Channel Bandwidths and Test SCS are checked separately for each NR CA band combination, which applicable channel bandwidths is specified in Table 5.5A.3.1-1 and SCS is specified in Table 5.3.5-1 for each NR band.  NOTE 3: UE operating in FDD mode, or in TDD mode in bands other than n40, n41, n77, n78 and n79, or in TDD mode the IE powerBoostPi2BPSK is set to 0 for bands n40, n41, n77, n78 and n79. | | | | | |

Table 6.5A.2.2.1.4.1-2: Intra-band contiguous CA Test Configuration Table for PC3 and PC2

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Initial Conditions | | | | | |
| Test Environment as specified in TS 38.508-1 [5] subclause 4.1 | | | Normal | | |
| Test Frequencies as specified in TS 38.508-1 [5] subclause4.3.1 | | | Low range  High range | | |
| Test Channel Bandwidths as specified in TS 38.508-1 [5] subclause 4.3.1 | | | Lowest NRB\_agg, Highest NRB\_agg  (NOTE 1) | | |
| Test SCS as specified in Table 5.3.5-1 | | | Lowest, Highest | | |
| Test Parameters for CA bandwidth class B and C | | | | | |
| Test ID | DL configuration for PCC & SCC | UL configuration | | | |
| Modulations for all CCs (NOTE 2) | | | RB allocation (NOTE 3) |
| 1 |  | DFT-s-OFDM | | Pi/2 BPSK | Outer Full |
| 2 |  | QPSK | Outer Full |
| 3 |  | 16QAM | Outer Full |
| 4 | N/A | 64QAM | Outer Full |
| 5 |  | 256QAM | Outer Full |
| 6 |  | CP-OFDM | | QPSK | Outer Full |
| 7 |  | 16QAM | Outer Full |
| 8 |  | 64QAM | Outer Full |
| 9 |  | 256QAM | Outer Full |
| NOTE 1: The Test CC Combination settings are checked separately for each CA Configuration, which applicable aggregated channel bandwidths are specified in Table 5.5A.1-1.  NOTE 2: DFT-s-OFDM Pi/2 BPSK test applies only for UEs which supports Pi/2 BPSK in FR1.  NOTE 3: The specific configuration of each RB allocation is defined in Table 6.1A-1a.  NOTE 4: If the UE supports multiple CC Combinations in the CA Configuration with the same NRB\_agg, only the combination with the highest NRB\_PCC is tested. | | | | | |

Table 6.5A.2.2.1.4.1-3: Intra-band non-contiguous CA Test Configuration Table

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Initial Conditions | | | | |
| Test Environment as specified in TS 38.508-1 [5] subclause 4.1 | | Normal | | |
| Test Frequencies as specified in TS 38.508-1 [5] subclause4.3.1.1.3 for inter band CA in FR1 | | Low range and High range test frequencies as specified in tables for non-contiguous CA configuration with UL CA | | |
| Test Channel Bandwidths as specified in TS 38.508-1 [5] subclause 4.3.1 | | Lowest for both PCC and SCC  Highest for both PCC and SCC | | |
| Test SCS as specified in Table 5.3.5-1 | | Smallest and biggest supported SCS per Channel Bandwidth | | |
| Test Parameters | | | | |
| Test ID | Downlink Configuration | Uplink Configuration | | |
| Modulation (NOTE 4) | RB allocation (NOTE 2) | |
| PCC | SCC |
| 1 | N/A | DFT-s-OFDM PI/2 BPSK | Edge\_1RB\_Left | Edge\_1RB\_Right |
| 2 | DFT-s-OFDM QPSK | Edge\_1RB\_Left | Edge\_1RB\_Right |
| 3 | DFT-s-OFDM 16 QAM | Edge\_1RB\_Left | Edge\_1RB\_Right |
| 4 | DFT-s-OFDM 64 QAM | Edge\_1RB\_Left | Edge\_1RB\_Right |
| 5 | DFT-s-OFDM 256 QAM | Edge\_1RB\_Left | Edge\_1RB\_Right |
| 6 | CP-OFDM QPSK | Edge\_1RB\_Left | Edge\_1RB\_Right |
| 7 | CP-OFDM 16 QAM | Edge\_1RB\_Left | Edge\_1RB\_Right |
| 8 | CP-OFDM 64 QAM | Edge\_1RB\_Left | Edge\_1RB\_Right |
| 9 | CP-OFDM 256 QAM | Edge\_1RB\_Left | Edge\_1RB\_Right |
| NOTE 1: This test configuration is only applicable for UEs indicating IE *dualPA-Architecture* supported  NOTE 2: The specific configuration of each RB allocation is defined in Table 6.1-1.  NOTE 3: Test Channel Bandwidths and Test SCS are checked separately for each NR CA band combination, which applicable channel bandwidths is specified in Table 5.5A.3.1-1 and SCS is specified in Table 5.3.5-1 for each NR band.  NOTE 4: DFT-s-OFDM PI/2 BPSK test applies only for UEs which supports half Pi BPSK in FR1. | | | | |

1. Connect the SS to the UE antenna connectors as shown in TS 38.508-1 [5] Annex A, in Figure A.3.1.1.3 for TE diagram and section A.3.2 for UE diagram.

2. The parameter settings for the cell are set up according to TS 38.508-1 [5] subclause 4.4.3.

3. Downlink signals for PCC are initially set up according to Annex C.0, C.1, C.2, and uplink signals according to Annex G.0, G.1, G.2, G.3.0.

4. The UL Reference Measurement channels are set according to Tables 6.5A.2.2.1.4.1-1 through 6.5A.2.2.1.4.1-3 as appropriate.

5. Propagation conditions are set according to Annex B.0.

6. Ensure the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On,* Test Mode *On* and Test Loop Function *On* according to TS 38.508-1 [5] clause 4.5. Message contents are defined in clause 6.5A.2.2.1.4.3.

6.5A.2.2.1.4.2 Test procedure

1. Configure SCC according to Annex C.0, C.1, C.2 for all downlink physical channels.

2. The SS shall configure SCC as per TS 38.508-1 [5] clause 5.5.1. Message contents are defined in clause 6.5A.2.2.1.4.3.

3. SS activates SCC by sending the activation MAC CE (Refer TS 38.321 [18], clauses 5.9, 6.1.3.10). Wait for at least 2 seconds (Refer TS 38.133[19], clause9.3).

4. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0\_1 for C\_RNTI to schedule the UL RMC according to Tables 6.5A.2.2.1.4.1-1 through 6.5A.2.2.1.4.1-3 on both PCC and SCC as appropriate. Since the UL has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC.

5. Send continuously power control “up” commands in every uplink scheduling information to the UE until the UE transmits at PUMAX level. Allow at least 200ms for the UE to reach PUMAX level.

6. For inter-band CA: measure the mean power of the UE in the channel bandwidth of the radio access mode for each CC according to the test configuration, which shall meet the requirements described in clause 6.2A.2. The period of the measurement shall be at least the continuous duration of one active sub-frame (1ms) and in the uplink symbols. For TDD slots with transient periods are not under test.

For intra-band CA: measure the mean power over all component carriers in the CA configuration of the radio access mode, which shall meet the requirements described in clause 6.2A.2. The period of the measurement shall be at least the continuous duration of one active sub-frame (1ms) and in the uplink symbols. For TDD slots with transient periods are not under test.

7. For inter-band CA: measure the power of the transmitted signal with a measurement filter of bandwidths for each CC according to Table 6.5A.2.2.1.5-1 and using a rms detector. If the sweep count is higher than one, the trace mode shall be average. The centre frequency of the filter shall be stepped in continuous steps according to the same table. The measured power shall be recorded for each step. The measurement period shall capture the active TSs.

For intra-band contiguous CA: measure the power of the transmitted signal with a measurement filter of bandwidths according to table 6.5A.2.2.1.5-3 and using a rms detector. If the sweep count is higher than one, the trace mode shall be average. The centre frequency of the filter shall be stepped in continuous steps according to the same table. The measured power shall be recorded for each step. The measurement period shall capture the active TSs. For power class 2 UE, the power is measured as the sum from both UE transmit antenna connectors when UE indicates support for *dualPA-Architecture* IE.

For intra-band non-contiguous CA: measure the power of the transmitted signal with a measurement filter of bandwidths according to Table 6.5A.2.2.1.5-1 and using a rms detector. If the sweep count is higher than one, the trace mode shall be average. The centre frequency of the filter shall be stepped in continuous steps according to the same table. The measured power shall be recorded for each step. The measurement period shall capture the active TSs. For power class 2 UE, the power is measured as the sum from both UE transmit antenna connectors when UE indicates support for *dualPA-Architecture* IE.

NOTE 1: When switching to DFT-s-OFDM waveform, as specified in the test configuration table 6.5.2.2.4.1-1, send an NR RRCReconfiguration message according to TS 38.508-1 [5] clause 4.6.3 Table 4.6.3-118 PUSCH-Config with TRANSFORM\_PRECODER\_ENABLED condition.

6.5A.2.2.1.4.3 Message contents

Message contents are according to TS 38.508-1 [5] subclause 4.6 with following exception.

Table 6.5A.2.2.1.4.3-1: FrequencyInfoUL-SIB for inter-band CA

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [5] Table 4.6.3-62 FrequencyInfoUL-SIB | | | |
| Information Element | Value/remark | Comment | Condition |
| p-Max | 22 |  | Power class 3 and Inter-band CA  Test IDs 1-4 |
|  | 21 |  | Power class 3 and Inter-band CA  Test IDs 5, 6 |
|  | 20 |  | Power class 3 and Inter-band CA  Test IDs 7, 9-13 |
|  | 19 |  | Power class 3 and Inter-band CA  Test IDs 8 |
|  | 17 |  | Power class 3 and Inter-band CA  Test IDs 14 |

Table 6.5A.2.2.1.4.3-1a: FrequencyInfoUL-SIB for inter-band CA (Power Class 2 with both bands supporting PC3)

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [5] Table 4.6.3-62 FrequencyInfoUL-SIB | | | |
| Information Element | Value/remark | Comment | Condition |
| p-Max | 23 |  | Test IDs 1-4 |
|  | 22 |  | Test IDs 5, 6 |
|  | 21 |  | Test IDs 7, 9-12 |
|  | 20 |  | Test IDs 13 |
|  | 19 |  | Test IDs 8 |
|  | 17 |  | Test IDs 14 |

Table 6.5A.2.2.1.4.3-1b: FrequencyInfoUL-SIB for inter-band CA (PCC supporting PC3 and SCC supporting PC3)

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [5] Table 4.6.3-62 FrequencyInfoUL-SIB | | | |
| Information Element | Value/remark | Comment | Condition |
| p-Max | 23 |  | Test IDs 1-4, 7 |
|  | 22 |  | Test IDs 5, 6, 9-13 |
|  | 21 |  | Test IDs 8 |
|  | 19 |  | Test IDs 14 |

Table 6.5A.2.2.1.4.3-2: FrequencyInfoUL-SIB for intra-band contiguous CA

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [5] Table 4.6.3-62 FrequencyInfoUL-SIB | | | |
| Information Element | Value/remark | Comment | Condition |
| p-Max | 20 |  | Power class 3 and Intra-band CA  Test IDs 2 |
|  | 17 |  | Power class 3 and Intra-band CA  Test IDs 3 |
|  | 16 |  | Power class 3 and Intra-band CA  Test IDs 1, 4, 5, 6, 8, 9 |
|  | 14 |  | Power class 3 and Intra-band CA  Test IDs 7 |
|  | 15 |  | Power class 2 and Test IDs 1, 2, 3, 4 |
|  | 14 |  | Power class 2 and Test IDs 5, 6, 7, 8, 9 |

6.5A.2.2.1.5 Test requirement

The measured UE mean power in the applicable channel bandwidth, derived in step 6, shall fulfil requirements in clause 6.2A.2 as appropriate, and the power of any UE emission, derived in step 7, shall fulfil requirements in Table 6.5A.2.2.1.5-1 for inter-band CA and table 6.5A.2.2.1.5-3 for intra-band contiguous CA. If for some frequency spectrum emission masks of component carriers overlap then spectrum emission mask allowing higher power spectral density applies for that frequency. If for some frequency a component carrier spectrum emission mask overlaps with the channel bandwidth of another component carrier, then the emission mask does not apply for that frequency.

Table 6.5A.2.2.1.5-1: NR General spectrum emission mask

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Spectrum emission limit (dBm) / Channel bandwidth | | | | | | | | | | | | | | |
| ΔfOOB  (MHz) | 5  MHz | 10  MHz | 15  MHz | 20  MHz | 25  MHz | 30 MHz | 40  MHz | 50  MHz | 60  MHz | 70  MHz | 80  MHz | 90  MHz | 100  MHz | Measurement bandwidth |
| ± 0-1 | -13+TT | -13+TT | -13+TT | -13+TT | -13+TT | -13+TT | -13+TT |  |  |  |  |  |  | 1 % channel bandwidth |
| ± 0-1 |  |  |  |  |  |  |  | -24 | -24 | -24 | -24 | -24 | -24 | 30 kHz |
| ± 1-5 | -10+TT | -10+TT | -10+TT | -10+TT | -10+TT | -10+TT | -10+TT | -10+TT | -10+TT | -10+TT | -10+TT | -10+TT | -10+TT | 1 MHz |
| ± 5-6 | -13+TT | -13+TT | -13+TT | -13+TT | -13+TT | -13+TT | -13+TT | -13+TT | -13+TT | -13+TT | -13+TT | -13+TT | -13+TT |
| ± 6-10 | -25+TT |
| ± 10-15 |  | -25+TT |
| ± 15-20 |  |  | -25+TT |
| ± 20-25 |  |  |  | -25+TT |
| ± 25-30 |  |  |  |  | -25+TT |
| ± 30-35 |  |  |  |  |  | -25+TT |
| ± 35-40 |  |  |  |  |  |  |
| ± 40-45 |  |  |  |  |  |  | -25+TT |
| ± 45-50 |  |  |  |  |  |  |  |
| ± 50-55 |  |  |  |  |  |  |  | -25+TT |
| ± 55-60 |  |  |  |  |  |  |  |  |
| ± 60-65 |  |  |  |  |  |  |  |  | -25+TT |
| ± 65-70 |  |  |  |  |  |  |  |  |  |
| ± 70-75 |  |  |  |  |  |  |  |  |  | -25+TT |
| ± 75-80 |  |  |  |  |  |  |  |  |  |  |
| ± 80-85 |  |  |  |  |  |  |  |  |  |  | -25+TT |
| ± 85-90 |  |  |  |  |  |  |  |  |  |  |  |
| ± 90-95 |  |  |  |  |  |  |  |  |  |  |  | -25+TT |
| ± 95-100 |  |  |  |  |  |  |  |  |  |  |  |  |
| ± 100-105 |  |  |  |  |  |  |  |  |  |  |  |  | -25+TT |
| Note 1: The first and last measurement position with a 30 kHz filter is at ΔfOOB equals to 0.015 MHz and 0.985 MHz.  Note 2: At the boundary of spectrum emission limit, the first and last measurement position with a 1 MHz filter is the inside of +0.5MHz and -0.5MHz, respectively.  Note 3: The measurements are to be performed above the upper edge of the channel and below the lower edge of the channel. | | | | | | | | | | | | | | |

Table 6.5A.2.2.1.5-2: Test Tolerance for Spectrum emission mask

|  |  |  |
| --- | --- | --- |
|  | f ≤ 3.0GHz | 3.0GHz < f ≤ 6GHz |
| BW ≤ 40MHz | 1.5dB | 1.8dB |
| 40MHz < BW ≤ 100MHz | 1.5dB | 1.8dB |

Table 6.5A.2.2.1.5-3: NR General spectrum emission mask for intra-band contiguous CA

|  |  |  |
| --- | --- | --- |
| ΔfOOB  (MHz) | Spectrum emission limit  (dBm) | MBW  (MHz) |
| ± 0 - 1 | -13+TT | Min(0.01\*BWchannel\_CA, 0.4) |
| ± 1 - 5 | -10+TT | 1MHz |
| ± 5 – BWchannel\_CA | -13+TT | 1MHz |
| ±BWchannel\_CA- BWchannel\_CA+5 | -25+TT | 1MHz |

NOTE: As a general rule, the resolution bandwidth of the measuring equipment should be equal to the measurement bandwidth. However, to improve measurement accuracy, sensitivity and efficiency, the resolution bandwidth may be smaller than the measurement bandwidth. When the resolution bandwidth is smaller than the measurement bandwidth, the result should be integrated over the measurement bandwidth in order to obtain the equivalent noise bandwidth of the measurement bandwidth.

#### 6.5A.2.3 Additional spectrum emission mask for CA

##### 6.5A.2.3.0 Minimum conformance requirements

6.5A.2.3.0.1 Additional spectrum emission mask for intra-band contiguous CA

6.5A.2.3.0.1.1 Requirements for network signalling value "CA\_NS\_04"

When "CA\_NS\_04" is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 6.5A.2.3.0.1.1-1. For power class 2 intra-band contiguous carrier aggregation, the additional spectrum emission mask is measured as the sum from both UE transmit antenna connectors when UE indicates support for *dualPA-Architecture* IE.

Table 6.5A.2.3.0.1.1-1: Additional requirements for "CA\_NS\_04"

|  |  |  |  |
| --- | --- | --- | --- |
| ΔfOOB  MHz | BWChannel\_CA (MHz) / Spectrum emission limit (dBm) | | Measurement bandwidth |
|  | ≤50 | >50 |  |
| ± 0 – 1 | -10 |  | 2 % of BWChannel\_CA |
|  |  | -10 | 1 MHz |
| ± 1 – 5 | -10 | | 1 MHz |
| ± 5 – X | -13 | |  |
| ± X - (BWChannel\_CA + 5 MHz) | -25 | |  |
| NOTE: X is aggregated bandwidth | | | |

The normative reference for this requirement is TS 38.101-1 [2] subclause 6.5A.2.3.1.

##### 6.5A.2.3.1 Additional spectrum emission mask for CA (2UL CA)

Editor’s note: The following aspects are either missing or not yet determined:

* Tests for network signalling value other than CA\_NS\_04 are not complete.

6.5A.2.3.1.1 Test purpose

To verify that the power of any UE emission shall not exceed specified level for the specified channel bandwidth under the deployment scenarios where additional requirements are specified.

6.5A.2.3.1.2 Test applicability

This test case applies to all types of NR UE release 15 and forward that supports 2UL CA.

6.5A.2.3.1.3 Minimum conformance requirements

The minimum conformance requirements are defined in subclause 6.5A.2.3.0.

6.5A.2.3.1.4 Test description

6.5A.2.3.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, test channel bandwidths and sub-carrier spacing based on NR CA configuration specified in clause 5.5A. All of these configurations shall be tested with applicable test parameters for each CA configuration, are shown below. The details of the uplink reference measurement channels (RMCs) are specified in Annexes A.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2

Table 6.5A.2.3.1.4.1-1: Test Configuration Table (network signalling value "CA\_NS\_04")

Same test configuration as listed in Table 6.2A.3.1.4.1-7 shall be used with the following exceptions:

* Only Test IDs 1~4 are tested.

1. Connect the SS to the UE antenna connectors as shown in TS 38.508-1 [5] Annex A, in Figure A.3.1.1.3 for TE diagram and section A.3.2 for UE diagram.

2. The parameter settings for the cell are set up according to TS 38.508-1 [5] subclause4.4.3.

3. Downlink signals for PCC are initially set up according to Annex C.0, C.1, C.2, and uplink signals according to Annex G.0, G.1, G.2, G.3.0.

4. The UL Reference Measurement channels are set according to the test configuration tables in clause 6.2A.2.1.4.1.

5. Propagation conditions are set according to Annex B.0

6. Ensure the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On,* Test Mode *On* and Test Loop Function *On* according to TS 38.508-1 [5] clause 4.5. Message contents are defined in clause 6.5A.2.3.1.4.3

6.5A.2.3.1.4.2 Test procedure

1. Configure SCC according to Annex C.0, C.1, C.2 for all downlink physical channels.

2. The SS shall configure SCC as per TS 38.508-1 [5] clause 5.5.1. Message contents are defined in clause 6.5A.2.3.1.4.3.

3. SS activates SCC by sending the activation MAC CE (Refer TS 38.321 [18], clauses 5.9, 6.1.3.10). Wait for at least 2 seconds (Refer TS 38.133[19], clause9.3).

4. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0\_1 for C\_RNTI to schedule the UL RMC according to Table 6.5A.2.3.1.4.1-1 on both PCC and SCC. Since the UL has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC.

5. Send continuously power control “up” commands in every uplink scheduling information to the UE until the UE transmits at PUMAX level. Allow at least 200ms for the UE to reach PUMAX level.

6. Measure the mean power over all component carriers in the CA configuration of the radio access mode, which shall meet the requirements described in clause 6.2A.3. The period of the measurement shall be at least the continuous duration of one active sub-frame (1ms) and in the uplink symbols. For TDD slots with transient periods are not under test. For power class 2 intra-band contiguous carrier aggregation, the additional spectrum emission mask is measured as the sum from both UE transmit antenna connectors when UE indicates support for *dualPA-Architecture* IE.

7. Measure the power of the transmitted signal with a measurement filter of bandwidths according to Table 6.5A.2.3.1.5.1-1 and using a rms detector. If the sweep count is higher than one, the trace mode shall be average. The centre frequency of the filter shall be stepped in continuous steps according to the same table. The measured power shall be recorded for each step. The measurement period shall capture the active TSs. For power class 2 UE, the power is measured as the sum from both UE transmit antenna connectors when UE indicates support for *dualPA-Architecture* IE.

6.5A.2.3.1.4.3 Message contents

Message contents are same as 6.2A.3.1.4.3.

6.5A.2.3.1.5 Test requirement

Table 6.5A.2.3.1.5-1: Test Tolerance for Additional Spectrum emission mask

|  |  |  |
| --- | --- | --- |
|  | f ≤ 3.0GHz | 3.0GHz < f ≤ 6GHz |
| BW ≤ 40MHz | 1.5dB | 1.8dB |
| 40MHz < BW ≤ 100MHz | 1.5dB | 1.8dB |

6.5A.2.3.1.5.1 Test requirements (network signalling value "CA\_NS\_04")

When "CA\_NS\_04" is indicated in the cell:

- the measured UE mean power in the channel bandwidth, derived in step 6, shall fulfil requirements in Table 6.2A.3.1.5-7 for UE power class 3 or Table 6.2A.3.1.5-8 UE power class 2.

and

- the power of any UE emission derived in step 7 shall fulfil requirements in table 6.5A.2.3.1.5.1-1.

Table 6.5A.2.3.1.5.1-1: Additional test requirements for "CA\_NS\_04"

|  |  |  |  |
| --- | --- | --- | --- |
| ΔfOOB  MHz | BWChannel\_CA (MHz) / Spectrum emission limit (dBm) | | Measurement bandwidth |
|  | ≤50 | >50 |  |
| ± 0 – 1 | -10+TT |  | 2 % of BWChannel\_CA |
|  |  | -10+TT | 1 MHz |
| ± 1 – 5 | -10+TT | | 1 MHz |
| ± 5 – X | -13+TT | |  |
| ± X - (BWChannel\_CA + 5 MHz) | -25+TT | |  |
| NOTE 1: X is aggregated bandwidth  NOTE 2: TT for each frequency and channel bandwidth is specified in Table 6.5A.2.3.1.5-1. | | | |

#### 6.5A.2.4 Adjacent channel leakage ratio

##### 6.5A.2.4.1 NR ACLR

###### 6.5A.2.4.1.0 Minimum conformance requirements

6.5A.2.4.1.0.1 NR ACLR for intra-band contiguous CA

For intra-band contiguous carrier aggregation the carrier aggregation the Adjacent Channel Leakage power Ratio is the ratio of the filtered mean power centred on the aggregated channel bandwidth to the filtered mean power centred on an adjacent aggregated channel bandwidth at nominal channel spacing. The assigned aggregated channel bandwidth power and adjacent aggregated channel bandwidth power are measured with rectangular filters with measurement bandwidths specified in Table 6.5A.2.4.1.0.1-1. If the measured adjacent channel power is greater than –50dBm then the NRACLR shall be higher than the value specified in Table 6.5A.2.4.1.0.1-1.

Table 6.5A.2.4.1.0.1-1: General requirements for intra-band contiguous CA ACLR

|  |  |
| --- | --- |
|  | ACLR / Measurement bandwidth |
| CA ACLR | 30 dB |
| CA Measurement bandwidth  (NOTE 1) | Nominal channel space+MBWACLR,low/2+ MBWACLR,high/2 |
| Adjacent channel centre frequency offset (in MHz) | + BWChannel\_CA  /  - BWChannel\_CA |
| Difference between ACLR MBW center and Fc,low | MBWshift= (MBWACLR\_CA-MBWACLR,low)/2 |
| NOTE 1: MBWACLR,low and MBWACLR,high are the single-channel ACLR measurement bandwidths specified for channel bandwidths BWchannel(low) and BWchannel(high) in 6.5.2.4.1.3, respectively. | |

Table 6.5A.2.4.1.0.1-2: requirements for intra-band contiguous CA ACLR power class 2

|  |  |
| --- | --- |
|  | ACLR / Measurement bandwidth |
| CA ACLR | 31 dB |
| CA Measurement bandwidth  (NOTE 1) | Nominal channel space+MBWACLR,low/2+ MBWACLR,high/2 |
| Adjacent channel centre frequency offset (in MHz) | + BWChannel\_CA  /  - BWChannel\_CA |
| Difference between ACLR MBW center and Fc,low | MBWshift= (MBWACLR\_CA-MBWACLR,low)/2 |
| NOTE 1: MBWACLR,low and MBWACLR,high are the single-channel ACLR measurement bandwidths specified for channel bandwidths BWchannel(low) and BWchannel(high) in 6.5.2.4.1.3 respectively. | |

6.5A.2.4.1.0.2 NR ACLR for intra-band non-contiguous CA

For intra-band non-contiguous carrier aggregation, CA Adjacent Channel Leakage power Ratio(CAACLR) is the ratio of the sum of the filtered mean power centred on each assigned channel frequency to the filtered mean power centred on an adjacent NR channel frequency at nominal channel spacing. In case the gap bandwidth Wgap between 2 uplink CCs is smaller than maximum of the 2 uplink channel bandwidths then no CAACLR requirement is set for the gap. Each assigned NR channel power and adjacent NR channel power are measured with rectangular filters with measurement bandwidths specified in Table 6.5.2.4.1.3-1. If the measured adjacent channel power is greater than –50dBm then the ACLR shall be higher than the value specified in Table 6.5A.2.4.1.0.2-1.

Table 6.5A.2.4.1.0.2-1: General requirements for intra-band non-contiguous CA ACLR

|  |  |
| --- | --- |
|  | ACLR / Measurement bandwidth |
| CA ACLR | 30 dB |
| CA Measurement bandwidth for each sub block  (NOTE 1) | MBWACLR |
| Adjacent channel centre frequency offset (in MHz) | + BWChannel  /  - BWChannel |
| NOTE 1: MBWACLR is the single-channel ACLR measurement bandwidths specified in 6.5.2.4.1.3. | |

When the signalling is absent for dualPA-Architecture IE, if carrier leakage or I/Q image lands inside the gap spectrum between 2 UL CCs when UL CCs are synchronized with frequencies in the gap , exception to the ACLR requirement with 3dB relaxation applies.

###### 6.5A.2.4.1.0.3 NR ACLR for Inter-band CA

For inter-band carrier aggregation with uplink assigned to two NR bands, the NR Adjacent Channel Leakage power Ratio (NRACLR) is defined per component carrier while both component carriers are active and the requirement is specified in clause 6.5.2.4.1.3.

###### 6.5A.2.4.1.1 NR ACLR for CA (2UL CA)

Editor’s Note: The following aspects are not yet determined:

- MU and TT for aggregate BW>100MHz are FFS.

6.5A.2.4.1.1.1 Test purpose

To verify that UE transmitter does not cause unacceptable interference to adjacent channels in terms of Adjacent Channel Leakage power Ratio (ACLR) for 2UL CA.

6.5A.2.4.1.1.2 Test applicability

This test case applies to all types of NR UE release 15 and forward that supports 2UL CA.

6.5A.2.4.1.1.3 Minimum conformance requirements

The minimum conformance requirements are defined in subclause 6.5A.2.4.1.0.

6.5A.2.4.1.1.4 Test description

6.5A.2.4.1.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, test channel bandwidths and sub-carrier spacing based on NR CA configuration specified in clause 5.5A. All of these configurations shall be tested with applicable test parameters for each CA configuration, are shown in the test configuration tables in clause 6.2A.2.1.4.1. The details of the uplink reference measurement channels (RMCs) are specified in Annexes A.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2

Table 6.5A.2.4.1.1.4.1-1: Void

Table 6.5A.2.4.1.1.4.1-2: Void

Table 6.5A.2.4.1.1.4.1-3: Void

1. Connect the SS to the UE antenna connectors as shown in TS 38.508-1 [5] Annex A, in Figure A.3.1.1.3 for TE diagram and section A.3.2 for UE diagram.

2. The parameter settings for the cell are set up according to TS 38.508-1 [5] subclause4.4.3.

3. Downlink signals for PCC are initially set up according to Annex C.0, C.1, C.2, and uplink signals according to Annex G.0, G.1, G.2, G.3.0.

4. The UL Reference Measurement channels are set according to the test configuration tables in clause 6.2A.2.1.4.1.

5. Propagation conditions are set according to Annex B.0

6. Ensure the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On,* Test Mode *On* and Test Loop Function *On* according to TS 38.508-1 [5] clause 4.5. Message contents are defined in clause 6.5A.2.4.1.1.4.3

6.5A.2.4.1.1.4.2 Test procedure

1. Configure SCC according to Annex C.0, C.1, C.2 for all downlink physical channels.

2. The SS shall configure SCC as per TS 38.508-1 [5] clause 5.5.1. Message contents are defined in clause 6.5A.2.4.1.1.4.3.

3. SS activates SCC by sending the activation MAC CE (Refer TS 38.321 [18], clauses 5.9, 6.1.3.10). Wait for at least 2 seconds (Refer TS 38.133[19], clause9.3).

4. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0\_1 for C\_RNTI to schedule the UL RMC according to the test configuration tables in clause 6.2A.2.1.4.1 on both PCC and SCC. Since the UL has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC.

5. Send continuously power control “up” commands in every uplink scheduling information to the UE until the UE transmits at PUMAX level. Allow at least 200ms for the UE to reach PUMAX level.

6. Measure the sum of mean transmitted power over all component carriers in the CA configuration of the radio access mode, as measured in step 6 of 6.2A.2.1.4.2, which shall meet the requirements in clause 6.2A.2.1.5 as appropriate.

7. For intra-band contiguous 2UL CA UE, execute 7a) to 7c):

7a) Measure the rectangular filtered mean power for the assigned NR aggregated channel bandwidth using a rms detector. If the sweep count is higher than one, the trace mode shall be average.

7b) Measure the rectangular filtered mean power of the first NR adjacent aggregated channel on both lower and upper side of the assigned NR channel using a rms detector, respectively. If the sweep count is higher than one, the trace mode shall be average.

7c) Calculate the ratios of the power between the values measured in step 7a) over step 7b) for lower and upper CA NRACLR, respectively.

8. For intra-band non-contiguous 2UL CA UE, execute 8a) to 8e):

8a) Measure the rectangular filtered mean power for the assigned NR channel on the lowest sub-block and highest sub-block respectively using a rms detector. If the sweep count is higher than one, the trace mode shall be average.

8b) Measure the rectangular filtered mean power of the first NR adjacent channel on lower side of the lowest sub-block, and the higher side of the highest sub-block (out of gap measurement) using a rms detector. If the sweep count is higher than one, the trace mode shall be average.

8c) If Wgap is larger or equeal to either of the sub-block bandwidths, perform this step, otherwise continue to next step. Measure the rectangular filtered mean power of the first NR adjacent channel on higher side of the lowest sub-block, and/or the lower side of the highest sub-block (in gap measurement).

8d) Calculate the ratio of the power between the values measured in step 8a) over step 8b) for CA NRACLR (out of gap measurement).

8e) Calculate the ratio of the power between the values measured in step 8a) over step 8c) for CA NRACLR (in gap measurement).

9. For inter-band 2UL CA UE, execute 9a) to 9f):

9a) Measure the rectangular filtered mean power for the assigned NR channel on PCC using a rms detector. If the sweep count is higher than one, the trace mode shall be average.

9b) Measure the rectangular filtered mean power of the first NR adjacent channel on both lower and upper side of the assigned NR channel on PCC, respectively using a rms detector. If the sweep count is higher than one, the trace mode shall be average.

9c) Calculate the ratios of the power between the values measured in step 9a) over step 9b) for lower and upper NR ACLR, respectively.

9d) Measure the rectangular filtered mean power for the assigned NR channel on SCC using a rms detector. If the sweep count is higher than one, the trace mode shall be average.

9e) Measure the rectangular filtered mean power of the first NR adjacent channel on both lower and upper side of the assigned NR channel on SCC, respectively using a rms detector. If the sweep count is higher than one, the trace mode shall be average.

9f) Calculate the ratios of the power between the values measured in step 9d over step 9e for lower and upper NR ACLR, respectively.

NOTE 1: When switching to DFT-s-OFDM waveform, as specified in the test configuration tables in clause 6.2A.2.1.4.1, send an NR RRCReconfiguration message according to TS 38.508-1 [5] clause 4.6.3 Table 4.6.3-118 PUSCH-Config with TRANSFORM\_PRECODER\_ENABLED condition.

6.5A.2.4.1.1.4.3 Message contents

Message contents are same as 6.2A.2.1.4.3.

Table 6.5A.2.4.1.1.4.3-1: Void

6.5A.2.4.1.1.5 Test requirement

The measured UE mean power in the channel bandwidth, derived in step 6, shall fulfil requirements in clause 6.2A.2.1 as appropriate, and if the measured adjacent channel power is greater than -50 dBm, then the measured NR ACLR derived in step 7c, step 8d, step 8e, and step 9f, shall be higher than the limits in Table 6.5A.2.4.1.1.5-1, Table 6.5A.2.4.1.1.5-1a, 6.5A.2.4.1.1.5-2 and 6.5A.2.4.1.1.5-3 respectively.

Table 6.5A.2.4.1.1.5-1: General requirements for intra-band contiguous CA ACLR power class 3

|  |  |
| --- | --- |
|  | ACLR / Measurement bandwidth |
| CA ACLR | 30 - TT dB |
| CA Measurement bandwidth  (NOTE 1) | Nominal channel space+MBWACLR,low/2+ MBWACLR,high/2 |
| Adjacent channel centre frequency offset (in MHz) | + BWChannel\_CA  /  - BWChannel\_CA |
| Difference between ACLR MBW center and Fc,low | MBWshift= (MBWACLR\_CA-MBWACLR,low)/2 |
| NOTE 1: MBWACLR,low and MBWACLR,high are the single-channel ACLR measurement bandwidths specified for channel bandwidths BWchannel(low) and BWchannel(high) in 6.5.2.4.1.3, respectively. | |

Table 6.5A.2.4.1.1.5-1a: General requirements for intra-band contiguous CA ACLR power class 2

|  |  |
| --- | --- |
|  | ACLR / Measurement bandwidth |
| CA ACLR | 31 - TT dB |
| CA Measurement bandwidth  (NOTE 1) | Nominal channel space+MBWACLR,low/2+ MBWACLR,high/2 |
| Adjacent channel centre frequency offset (in MHz) | + BWChannel\_CA  /  - BWChannel\_CA |
| Difference between ACLR MBW center and Fc,low | MBWshift= (MBWACLR\_CA-MBWACLR,low)/2 |
| NOTE 1: MBWACLR,low and MBWACLR,high are the single-channel ACLR measurement bandwidths specified for channel bandwidths BWchannel(low) and BWchannel(high) in 6.5.2.4.1.3, respectively. | |

Table 6.5A.2.4.1.1.5-2: General requirements for intra-band non-contiguous CA ACLR

|  |  |
| --- | --- |
|  | ACLR / Measurement bandwidth |
| CA ACLR | 30 - TT dB |
| CA Measurement bandwidth for each sub block  (NOTE 1) | MBWACLR |
| Adjacent channel centre frequency offset (in MHz) | + BWChannel  /  - BWChannel |
| NOTE 1: MBWACLR is the single-channel ACLR measurement bandwidths specified in 6.5.2.4.1. | |

Table 6.5A.2.4.1.1.5-3: General requirements for inter-band CA ACLR

|  |  |  |  |
| --- | --- | --- | --- |
|  | Power class 1 | Power class 2 | Power class 3 |
| NR ACLR |  | 31 - TT dB | 30 - TT dB |

Table 6.5A.2.4.1.1.5-4: NR ACLR measurement bandwidth for inter-band CA

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| NR channel bandwidth / NR ACLR measurement bandwidth | | | | | | | | | | | | |
|  | 5 MHz | 10 MHz | 15 MHz | 20 MHz | 25 MHz | 30 MHz | 40 MHz | 50 MHz | 60 MHz | 80 MHz | 90 MHz | 100 MHz |
| NR ACLR measurement bandwidth | 4.515 | 9.375 | 14.235 | 19.095 | 23.955 | 28.815 | 38.895 | 48.615 | 58.35 | 78.15 | 88.23 | 98.31 |

Table 6.5A.2.4.1.1.5-5: Test Tolerance for NR ACLR

|  |  |  |
| --- | --- | --- |
|  | f ≤ 3.0GHz | 3.0GHz < f ≤ 6GHz |
| BW ≤ 100MHz | 0.8dB | 0.8dB |
| Aggregated BW ≤ 200MHz | FFS | FFS |

##### 6.5A.2.4.2 UTRA ACLR

Editor’s note:

* No UTRA ACLR minimum requirements for intra-band CA are specified in TS 38.101-1

###### 6.5A.2.4.2.0 Minimum conformance requirements

For inter-band carrier aggregation with uplink assigned to two NR bands, the UTRA Adjacent Channel Leakage power Ratio (UTRA ACLR) is defined per component carrier while both component carrier are active and the requirement is specified in clause 6.5.2.4.2.3.

The normative reference for this requirement is TS 38.101-1 [2] clause 6.5A.2.4.2.

###### 6.5A.2.4.2.1 UTRA ACLR for CA (2UL CA)

6.5A.2.4.2.1.1 Test purpose

To verify that UE transmitter does not cause unacceptable interference to adjacent UTRA channels in terms of Adjacent Channel Leakage power Ratio (UTRA ACLR) for 2UL CA.

6.5A.2.4.2.1.2 Test applicability

This test case applies for network signalling values NS\_03U, NS\_05U, NS\_43U, and NS\_100 to all types of NR UE release 15 and forward that supports 2UL inter-band CA.

6.5A.2.4.2.1.3 Minimum conformance requirements

The minimum conformance requirements are defined in subclause 6.5A.2.4.2.0.

6.5A.2.4.2.1.4 Test description

6.5A.2.4.2.1.4.1 Initial conditions

Same as in subclause 6.2A.3.1.4.1 with the following exepction;

- Only network signalling values NS\_03U, NS\_05U, NS\_43U, and NS\_100 with the corresponding CA configuration defined in Table 6.2A.3.1.4.1-1 need to perform UTRA ACLR test.

- Message contents in step 6 are defined in clause 6.5A.2.4.2.1.4.3.

6.5A.2.4.2.1.4.2 Test procedure

1. Configure SCC according to Annex C.0, C.1, C.2 for all downlink physical channels.

2. The SS shall configure SCC as per TS 38.508-1 [5] clause 5.5.1. Message contents are defined in clause 6.5A.2.4.2.1.4.3.

3. SS activates SCC by sending the activation MAC CE (Refer TS 38.321 [18], clauses 5.9, 6.1.3.10). Wait for at least 2 seconds (Refer TS 38.133[19], clause9.3).

4. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0\_1 for C\_RNTI to schedule the UL RMC according to the applicable test configuration tables in clause 6.2A.3.1.4.1 on both PCC and SCC. Since the UL has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC.

5. Send continuously power control “up” commands in every uplink scheduling information to the UE until the UE transmits at PUMAX level. Allow at least 200ms for the UE to reach PUMAX level.

6. Measure the sum of mean transmitted power over all component carriers in the CA configuration of the radio access mode. The period of measurement shall be at least the continuous duration of 1ms uplink. For TDD only slots consisting of only UL symbols are under test. For FDD band in inter-band CA with both TDD band and FDD band, only slots overlapping with only UL symbols in TDD are under test.

7. Measure the rectangular filtered mean power for the assigned NR channel on PCC using a rms detector. If the sweep count is higher than one, the trace mode shall be average.

8. Measure the RRC filtered mean power of the first and the second UTRA adjacent channel on both lower and upper side of the assigned NR channel on PCC using a rms detector, respectively. If the sweep count is higher than one, the trace mode shall be average.

9. Calculate the ratios of the power between the values measured in step 7 over step 8 for lower and upper UTRA ACLR, respectively.

10. Measure the rectangular filtered mean power for the assigned NR channel on SCC using a rms detector. If the sweep count is higher than one, the trace mode shall be average.

11. Measure the RRC filtered mean power of the first and the second UTRA adjacent channel on both lower and upper side of the assigned NR channel on SCC using a rms detector, respectively. If the sweep count is higher than one, the trace mode shall be average.

12. Calculate the ratios of the power between the values measured in step 10 over step 11 for lower and upper UTRA ACLR, respectively.

NOTE 1: When switching to DFT-s-OFDM waveform, as specified in the test configuration table 6.5.2.2.4.1-1, send an NR RRCReconfiguration message according to TS 38.508-1 [5] clause 4.6.3 Table 4.6.3-118 PUSCH-Config with TRANSFORM\_PRECODER\_ENABLED condition.

6.5A.2.4.2.1.4.3 Message contents

Message contents are according to TS 38.508-1 [5] subclause 4.6 with the following exceptions:

Table 6.5A.2.4.2.1.4.3-1: FrequencyInfoUL-SIB for inter-band CA

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [5] Table 4.6.3-62 FrequencyInfoUL-SIB | | | |
| Information Element | Value/remark | Comment | Condition |
| p-Max | 20 |  | Power class 3 and Inter-band CA |

6.5A.2.4.2.1.4.3.1 Message contents exceptions (network signalling value "NS\_100" on PCC)

Table 6.5A.2.4.2.1.4.3.1-1: *AdditionalSpectrumEmission*: Additional spurious emissions test requirement for "NS\_100" on PCC

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [5] clause 4.6.3, Table 4.6.3-1 *AdditionalSpectrumEmission* | | | |
| Information Element | Value/remark | Comment | Condition |
| AdditionalSpectrumEmission | 1 (NS\_100) |  | not for band n65 |
| 2 (NS\_100) |  | for band n65 |

6.5A.2.4.2.1.4.3.2 Message contents exceptions (network signalling value "NS\_43U" on PCC)

Table 6.5A.2.4.2.1.4.3.2-1: *AdditionalSpectrumEmission*: Additional spurious emissions test requirement for "NS\_43U" on PCC

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [5] clause 4.6.3, Table 4.6.3-1 *AdditionalSpectrumEmission* | | | |
| Information Element | Value/remark | Comment | Condition |
| AdditionalSpectrumEmission | 3 (NS\_43U) |  |  |

6.5A.2.4.2.1.5 Test requirement

The measured UE mean power in the channel bandwidth, derived in step 6, shall fulfil requirements in clause 6.2A.3.1 as appropriate, and if the measured adjacent channel power is greater than –50 dBm, then the measured UTRA ACLR for each CC, derived in step 9 and step 13, shall be higher than the limits in Table 6.5A.2.4.2.1.5-2.

Table 6.5A.2.4.2.1.5-1: Measurement bandwidth for NR carrier

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | NR channel bandwidth / UTRA ACLR measurement bandwidth | | | | | | | | | | | | |
| 5 MHz | 10 MHz | 15 MHz | 20 MHz | 25 MHz | 30 MHz | 40 MHz | 50 MHz | 60 MHz | 70 MHz | 80 MHz | 90 MHz | 100 MHz |
| NR channel measurement bandwidth (MHz) | 4.515 | 9.375 | 14.235 | 19.095 | 23.955 | 28.815 | 38.895 | 48.615 | 58.35 | 68.07 | 78.15 | 88.23 | 98.31 |
| UTRA channel Measurement bandwidth (MHz) | 3.84 | | | | | | | | | | | | |
| 1st Adjacent channel centre frequency offset | ± 2.5 MHz from NR channel edge | | | | | | | | | | | | |
| 2nd Adjacent channel centre frequency offset | ± 7.5 MHz from NR channel edge | | | | | | | | | | | | |

Table 6.5A.2.4.2.1.5-2: UTRA ACLR requirement

|  |  |
| --- | --- |
|  | Power class 3 |
| UTRAACLR1 | 33 dB -TT |
| UTRAACLR2 | 36 dB - TT |

Table 6.5A.2.4.2.1.5-3: Test Tolerance for UTRA ACLR

|  |  |  |
| --- | --- | --- |
|  | f ≤ 3.0GHz | 3.0GHz < f ≤ 6GHz |
| BW ≤ 100MHz | 0.8dB | 0.8dB |

### 6.5A.3 Spurious emission for CA

#### 6.5A.3.1 General spurious emissions for CA

##### 6.5A.3.1.0 Minimum conformance requirements

For inter-band carrier aggregation with uplink assigned to two NR bands, the spurious emission requirement Table 6.5.3.1.3-2 apply for the frequency ranges that are more than FOOB as defined in Table 6.5.3.1.3-1 away from edges of the assigned channel bandwidth on a component carrier. If for some frequency a spurious emission requirement of individual component carrier overlaps with the spectrum emission mask or channel bandwidth of another component carrier then it does not apply.

NOTE 1: For inter-band carrier aggregation with uplink assigned to two NR bands the requirements in Table 6.5.3.1.3-2 could be verified by measuring spurious emissions at the specific frequencies where second and third order intermodulation products generated by the two transmitted carriers can occur; in that case, the requirements for remaining applicable frequencies in Table 6.5.3.1.3-2 would be considered to be verified by the measurements verifying the one uplink inter-band CA spurious emission requirement.

For intra-band contiguous carrier aggregation the spurious emission limits apply for the frequency ranges that are more than FOOB (MHz) in Table 6.5A.3.1.0-1 from the edge of the aggregated channel bandwidth. For frequencies ΔfOOB greater than FOOB as specified in Table 6.5A.3.1.0-1 the spurious emission requirements in Table 6.5.3.1.3-2 are applicable. For power class 2 intra-band contiguous carrier aggregation, the spurious emissions is measured as the sum from both UE transmit antenna connectors when UE indicates support for *dualPA-Architecture* IE.

Table 6.5A.3.1.0-1: Boundary between out of band and spurious emission domain for intra-band contiguous carrier aggregation

|  |  |
| --- | --- |
| Aggregated Channel bandwidth | OOB boundary FOOB (MHz) |
| BWChannel\_CA | BWChannel\_CA + 5 |

For intra-band non-contiguous carrier aggregation transmission the spurious emission requirement is defined as a composite spurious emission requirement. Composite spurious emission requirement applies to frequency ranges that are more than FOOB away from the edges of each carrier in the gap and out of the gap. Composite spurious emission requirement is defined as follows:

a) Composite spurious emission requirement is a combination of individual sub-block spurious emission requirements

b) In case the sub-block consist of one component carrier the sub-lock spurious emission requirement and FOOB are defined in subclause 6.5.3.1

c) If for some frequency an individual sub-block spurious emission requirement overlaps with the general spectrum emission mask or the sub-block bandwidth of another sub-block then it does not apply

For intra-band non-contiguous carrier aggregation, the spurious emissions is measured as the sum from both UE transmit antenna connectors when UE indicates support for *dualPA-Architecture* IE.

For combinations of intra-band and inter-band carrier aggregation with three uplink component carriers (up to two contiguously aggregated carriers per operating band), the spurious emission requirement is defined as follows. For the NR band supporting one component carrier the requirements in Table 6.5.3.1.3-2 apply for frequency ranges that are more than FOOB (MHz) from the edges of assigned channel bandwidth as defined in Table 6.5.3.1.3-1. For the NR band supporting two contiguous component carriers the requirements in Table 6.5.3.1-2 apply for frequency ranges that are more than FOOB (MHz) from the edges of assigned aggregated channel bandwidth as defined in Table 6.5A.3.1.3-1. If for some frequency a spurious emission requirement of a single component carrier or two contiguous component carriers overlap with the spurious emission requirement or channel bandwidth of another component carrier or two contiguously aggregated carriers then it does not apply.

The normative reference for this requirement is TS 38.101-1 [2] subclause 6.5A.3.1

##### 6.5A.3.1.1 General spurious emissions for CA (2UL CA)

6.5A.3.1.1.1 Test purpose

To verify that UE transmitter does not cause unacceptable interference to other channels or other systems in terms of transmitter spurious emissions.

6.5A.3.1.1.2 Test applicability

This test case applies to all types of NR UE release 15 and forward that supports 2UL CA.

6.5A.3.1.1.3 Minimum conformance requirements

The minimum conformance requirements are defined in subclause 6.5A.3.1.0.

6.5A.3.1.1.4 Test description

6.5A.3.1.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, test channel bandwidths and sub-carrier spacing based on NR CA configuration specified in clause 5.5A. All of these configurations shall be tested with applicable test parameters for each CA configuration, are shown in Tables 6.5A.3.1.1.4.1-1 to 6.5A.3.1.1.4.1-3. The details of the uplink reference measurement channels (RMCs) are specified in Annexes A.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Table 6.5A.3.1.1.4.1-1: Inter band CA Test Configuration Table

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Initial Conditions | | | | |
| Test Environment as specified in TS 38.508-1 [5] subclause 4.1 | | Normal | | |
| Test Frequencies as specified in TS 38.508-1 [5] subclause4.3.1.1.3 for inter band CA in FR1 | | Low range for PCC and SCC  High range for PCC and SCC | | |
| Test Channel Bandwidths as specified in TS 38.508-1 [5] subclause 4.3.1 | | Lowest NRB\_agg for both PCC and SCC  Highest NRB\_agg for both PCC and SCC | | |
| Test SCS as specified in Table 5.3.5-1 | | Lowest | | |
| Test Parameters | | | | |
| Test ID | Downlink Configuration | Uplink Configuration | | |
| Modulation | RB allocation (NOTE 1) | |
| PCC | SCC |
| 1 | N/A | CP-OFDM QPSK | Outer\_Full | Outer\_Full |
| 2 | CP-OFDM QPSK | Edge\_1RB\_Left | Edge\_1RB\_Left |
| 3 | CP-OFDM QPSK | Edge\_1RB\_Right | Edge\_1RB\_Right |
| NOTE 1: The specific configuration of each RB allocation is defined in Table 6.1-1.  NOTE 2: Test Channel Bandwidths and Test SCS are checked separately for each NR CA band combination, which applicable channel bandwidths is specified in Table 5.5A.3.1-1 and SCS is specified in Table 5.3.5-1 for each NR band. | | | | |

Table 6.5A.3.1.1.4.1-2: Intra-band contiguous CA Test Configuration Table

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Initial Conditions | | | | |
| Test Environment as specified in TS 38.508-1 [5] subclause 4.1 | | Normal | | |
| Test Frequencies as specified in TS 38.508-1 [5] subclause4.3.1.1.3 for inter band CA in FR1 | | Low range  High range | | |
| Test Channel Bandwidths as specified in TS 38.508-1 [5] subclause 4.3.1 | | Lowest NRB\_agg  Highest NRB\_agg | | |
| Test SCS as specified in Table 5.3.5-1 | | Lowest | | |
| Test Parameters | | | | |
| Test ID | Downlink Configuration | Uplink Configuration | | |
| Modulation | RB allocation (NOTE 1) | |
| PCC | SCC |
| 1 | N/A | CP-OFDM QPSK | Outer\_Full | N/A |
| 2 | CP-OFDM QPSK | Edge\_1RB\_Left | N/A |
| 3 | CP-OFDM QPSK | Edge\_1RB\_Right | N/A |
| 4 | CP-OFDM QPSK | Edge\_1RB\_Left | Edge\_1RB\_Right |
| 5 | CP-OFDM QPSK | Outer\_Full | Outer\_Full |
| NOTE 1: The specific configuration of each RB allocation is defined in Table 6.1-1.  NOTE 2: Test Channel Bandwidths and Test SCS are checked separately for each NR CA band combination, which applicable channel bandwidths is specified in Table 5.5A.3.1-1 and SCS is specified in Table 5.3.5-1 for each NR band.. | | | | |

Table 6.5A.3.1.1.4.1-3: Intra-band non-contiguous CA Test Configuration Table

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Initial Conditions | | | | |
| Test Environment as specified in TS 38.508-1 [5] subclause 4.1 | | Normal | | |
| Test Frequencies as specified in TS 38.508-1 [5] subclause4.3.1.1.3 for inter band CA in FR1 | | Low range and High range test frequencies as specified in tables for non-contiguous CA configuration with UL CA | | |
| Test Channel Bandwidths as specified in TS 38.508-1 [5] subclause 4.3.1 | | Lowest NRB\_agg  Highest NRB\_agg | | |
| Test SCS as specified in Table 5.3.5-1 | | Lowest | | |
| Test Parameters | | | | |
| Test ID | Downlink Configuration | Uplink Configuration | | |
| Modulation | RB allocation (NOTE 1) | |
| PCC | SCC |
| 1 | N/A | CP-OFDM QPSK | Edge\_1RB\_Left | Edge\_1RB\_Left |
| 2 | CP-OFDM QPSK | Edge\_1RB\_Right | Edge\_1RB\_Right |
| 3 | CP-OFDM QPSK | Outer\_Full | Outer\_Full |
| NOTE 1: The specific configuration of each RB allocation is defined in Table 6.1-1.  NOTE 2: Test Channel Bandwidths and Test SCS are checked separately for each NR CA band combination, which applicable channel bandwidths is specified in Table 5.5A.3.1-1 and SCS is specified in Table 5.3.5-1 for each NR band. | | | | |

1. Connect the SS to the UE antenna connectors as shown in TS 38.508-1 [5] Annex A, in Figure A.3.1.1.3 for TE diagram and section A.3.2 for UE diagram.

2. The parameter settings for the cell are set up according to TS 38.508-1 [5] subclause 4.4.3.

3. Downlink signals for PCC are initially set up according to Annex C.0, C.1 and C.2, and uplink signals according to Annex G.0, G.1, G.2, G.3.0.

4. The UL Reference Measurement channels are set according to Tables 6.5A.3.1.1.4.1-1, 6.5A.3.1.1.4.1-2 and 6.5A.3.1.1.4.1-3 as appropriate.

5. Propagation conditions are set according to Annex B.0.

6. Ensure the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On,* Test Mode *On* and Test Loop Function *On* according to TS 38.508-1 [5] clause 4.5. Message contents are defined in clause 6.5A.3.1.1.4.3.

6.5A.3.1.1.4.2 Test procedure

1. Configure SCC according to Annex C.0, C.1, C.2 for all downlink physical channels.

2. The SS shall configure SCC as per TS 38.508-1 [5] clause 5.1.1. Message contents are defined in clause 6.5A.3.1.1.4.3.

3. SS activates SCC by sending the activation MAC CE (Refer TS 38.321 [18], clauses 5.9, 6.1.3.10). Wait for at least 2 seconds (Refer TS 38.133[19], clause9.3).

4. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0\_1 for C\_RNTI to schedule the UL RMC according to Tables 6.5A.3.1.1.4.1-1, 6.5A.3.1.1.4.1-2 and 6.5A.3.1.1.4.1-3 as appropriate on both PCC and SCC. Since the UE has no payload data to send, the UE transmits uplink MAC padding bits on the UL RMC.

5. Send continuously uplink power control "up" commands in every uplink scheduling information to the UE until the UE transmits at PUMAX level.

6. Measure the power of the transmitted signal with a measurement filter of bandwidths according to Table 6.5A.3.1.1.5-1 for inter-band CA, table 6.5A.3.1.1.5-3 for intra-band contiguous CA and intra-band non-contiguous CA. The centre frequency of the filter shall be stepped in contiguous steps according to Table 6.5A.3.1.1.5-1 for inter-band CA, table 6.5A.3.1.1.5-3 for intra-band contiguous CA and intra-band non-contiguous CA.

The measured power shall be verified for each step. The measurement period shall capture the active time slots. During measurement the spectrum analyser shall be set to 'Detector' = RMS. If the sweep count is higher than one, the trace mode shall be average. For power class 2 intra-band contiguous carrier aggregation, the spurious emissions is measured as the sum from both UE transmit antenna connectors when UE indicates support for dualPA-Architecture IE.

6.5A.3.1.1.4.3 Message contents

Message contents are according to TS 38.508-1 [5] subclause 4.6 with following exception.

Table 6.5A.3.1.1.4.3-1: FrequencyInfoUL-SIB for inter-band CA

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [5] Table 4.6.3-62 FrequencyInfoUL-SIB | | | |
| Information Element | Value/remark | Comment | Condition |
| p-Max | 16 |  | Power class 3 and Inter-band CA |

Table 6.5A.3.1.1.4.3-2: FrequencyInfoUL-SIB for intra-band contiguous CA

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [5] Table 4.6.3-62 FrequencyInfoUL-SIB | | | |
| Information Element | Value/remark | Comment | Condition |
| p-Max | 10 |  | Power class 3 and Intra-band contiguous CA with Bandwidth class C  Test ID 4 |
|  | 5 |  | Power class 3 and Intra-band contiguous CA with Bandwidth class C  Test ID 5 |
|  | 8 |  | Power class 3 and Intra-band contiguous CA with Bandwidth class B  Test ID 4 |
|  | 3 |  | Power class 3 and Intra-band contiguous CA with Bandwidth class B  Test ID 5 |
|  | 11 |  | Power class 2 and Intra-band contiguous CA with Bandwidth class C  Test ID 4 |
|  | 5 |  | Power class 3 and Intra-band contiguous CA with Bandwidth class C  Test ID 5 |

6.5A.3.1.1.5 Test requirement

This clause specifies the requirements for the specified NR band for Transmitter Spurious emissions requirement with frequency range as indicated in Table 6.5A.3.1.1.5-1 for inter-band UL CA configuration and Table 6.5A.3.1.1.5-3 for intra-band contiguous and non-contiguous UL CA configuration. The test requirement of configurations for CA operating band including Band n41 also apply for the corresponding CA operating bands with Band n90 replacing Band n41.

For inter-band CA, the spurious emission limits apply for the frequency ranges that are more than ΔfOOB (MHz) in Table 6.5.3.1.3-1 from the edge of the channel bandwidth. If for some frequency a spurious emission requirement of individual component carrier overlaps with the spectrum emission mask or channel bandwidth of another component carrier, then it does not apply.

For intra-band contiguous CA, the spurious emission limits apply for the frequency ranges that are more than ΔfOOB (MHz) in Table 6.5A.3.1.0-1 from the edge of the aggregated channel bandwidth.

For intra-band non-contiguous CA, the spurious emission limits apply to frequency ranges that are more than FOOB in Table 6.5.3.1.3-1 away from the edges of each carrier in the gap and out of the gap.

The measured average power of spurious emission, derived in step 6, shall not exceed the described value in Table 6.5A.3.1.1.5-1 for inter-band UL CA configuration and Table 6.5A.3.1.1.5-3 for intra-band contiguous UL CA and intra-band non-contiguous configuration.

Table 6.5A.3.1.1.5-1: General spurious emissions test requirements for inter-band UL CA

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Frequency Range | | Maximum Level | | Measurement Bandwidth | | Notes | |
| Test requirements for CA\_n1A-n3A Configuration | | | | | | | |
| 135 MHz ≤ f ≤ 270 MHz | | -36  dBm+TT | | 100kHz | |  | |
| 1440 MHz ≤ f ≤ 1650 MHz  2055 MHz ≤ f ≤ 2250 MHz  3630 MHz ≤ f ≤ 3765 MHz  5340 MHz ≤ f ≤ 5550 MHz  5550 MHz ≤ f ≤ 5745 MHz | | -30  dBm+TT | | 1MHz | |  | |
| Test requirements for CA\_n1A-n8A Configuration | | | | | | | |
| 90 MHz ≤ f ≤ 220 MHz | | -36  dBm+TT | | 100kHz | |  | |
| 1005 MHz ≤ f ≤ 1100 MHz  2800 MHz ≤ f ≤ 2895 MHz  2925 MHz ≤ f ≤ 3080 MHz  3680 MHz ≤ f ≤ 3810 MHz  4720 MHz ≤ f ≤ 4875 MHz | | -30  dBm+TT | | 1MHz | |  | |
| Test requirements for CA\_n1A-n28A Configuration | | | | | | | |
| 424 MHz ≤ f ≤ 574 MHz | | -36  dBm+TT | | 100kHz | |  | |
| 1172 MHz ≤ f ≤ 1277 MHz  2623 MHz ≤ f ≤ 2728 MHz  3092 MHz ≤ f ≤ 3257 MHz  3326 MHz ≤ f ≤ 3476 MHz  4543 MHz ≤ f ≤ 4708 MHz | | -30  dBm+TT | | 1MHz | |  | |
| Test requirements for CA\_n1A-n78A Configuration | | | | | | | |
| 40 MHz ≤ f ≤ 660 MHz | | -36  dBm+TT | | 100kHz | |  | |
| 1320 MHz ≤ f ≤ 1880 MHz  4620 MHz ≤ f ≤ 5780 MHz  7140 MHz ≤ f ≤ 7760 MHz  8520 MHz ≤ f ≤ 9580 MHz | | -30  dBm+TT | | 1MHz | |  | |
| Test requirements for CA\_n1A-n79A Configuration | | | | | | | |
| 440 MHz ≤ f ≤ 1000 MHz | | -36  dBm+TT | | 100kHz | |  | |
| 1000 MHz ≤ f ≤ 1160 MHz  2420 MHz ≤ f ≤ 3080 MHz  6320 MHz ≤ f ≤ 8080 MHz  8240 MHz ≤ f ≤ 8960 MHz  10720 MHz ≤ f ≤ 11980 MHz | | -30  dBm+TT | | 1MHz | |  | |
| Test requirements for CA\_n2A-n5A Configuration | | | | | | | |
| 152 MHz ≤ f ≤ 262 MHz | | -36 dBm+TT | | 100 kHz | |  | |
| 1001 MHz ≤ f ≤ 1086 MHz 2674 MHz ≤ f ≤ 2759 MHz 2851 MHz ≤ f ≤ 2996 MHz 3498 MHz ≤ f ≤ 3608 MHz 4524 MHz ≤ f ≤ 4669 MHz | | -30 dBm+TT | | 1 MHz | |  | |
| **Test requirements for CA\_n2A-n14A Configuration** | | | | | | | |
| 254 MHz ≤ f ≤ 334 MHz | | -36 dBm+TT | | 100 kHz | |  | |
| 1052 MHz ≤ f ≤ 1122 MHz  2638 MHz ≤ f ≤ 2708 MHz  2902 MHz ≤ f ≤ 3032 MHz  3426 MHz ≤ f ≤ 3506 MHz | | -30 dBm+TT | | 1 MHz | |  | |
| Test requirements for CA\_n2A-n48A Configuration | | | | | | | |
| 9 kHz ≤ f < 150 kHz | | -36 dBm | | 1 kHz | |  | |
| 150 kHz ≤ f < 30 MHz | | -36 dBm | | 10 kHz | |  | |
| 30 MHz ≤ f < 270 MHz | | -36 dBm | | 100 kHz | |  | |
| 1640 MHz ≤ f ≤ 1850 MHz 5190 MHz ≤ f ≤ 5610 MHz 7250 MHz ≤ f ≤ 7520 MHz 8950 MHz ≤ f ≤ 9310 MHz | | -30 dBm | | 1 MHz | |  | |
| **Test requirements for CA\_n2A-n77A Configuration** | | | | | | | |
| 500 MHz ≤ f ≤ 520 MHz | | -36 dBm +TT | | 100 kHz | |  | |
| 1390 MHz ≤ f ≤ 2350 MHz 4690 MHz ≤ f ≤ 6550 MHz 7000 MHz ≤ f ≤ 8020 MHz 8450 MHz ≤ f ≤ 10310 MHz | | -30 dBm +TT | | 1 MHz | |  | |
| **Test requirements for CA\_n3A-n8A Configuration** | | | | | | | |
| 25 MHz ≤ f <30 MHz | | -36 dBm | | 10kHz | |  | |
| 30 MHz ≤ f ≤ 120 MHz  795 MHz ≤ f ≤ 905 MHz | | -36 dBm | | 100kHz | |  | |
| 2505 MHz ≤ f ≤ 2700 MHz  3470 MHz ≤ f ≤ 3615 MHz  4300 MHz ≤ f ≤ 4485 MHz | | -30 dBm | | 1MHz | |  | |
| **Test requirements for CA\_n3A-n28A Configuration** | | | | | | | |
| 214 MHz ≤ f ≤ 379 MHz 962 MHz ≤ f ≤ 1000 MHz | | -36 dBm +TT | | 100 kHz | |  | |
| 1000 MHz ≤ f ≤ 1082 MHz 2413 MHz ≤ f ≤ 2533 MHz 2672 MHz ≤ f ≤ 2867 MHz 3116 MHz ≤ f ≤ 3281 MHz 4123 MHz ≤ f ≤ 4318 MHz | | -30 dBm +TT | | 1 MHz | |  | |
| **Test requirements for CA\_n3A-n41A Configuration** | | | | | | | |
| 711 MHz ≤ f ≤ 1000 MHz | | -36 dBm +TT | | 100 kHz | |  | |
| 1000 MHz ≤ f ≤ 1074 MHz  3207 MHz ≤ f ≤ 3670 MHz  4206 MHz ≤ f ≤ 4475 MHz  5916 MHz ≤ f ≤ 6260 MHz  6702 MHz ≤ f ≤ 7165 MHz | | -30 dBm | | 1MHz | | To be tested with NS\_01 signalled for band n41 | |
|  | | -25 dBm | | 1MHz | | To be tested with NS\_04 signalled for band n41 | |
| Test requirements for CA\_n3A-n77A Configuration | | | | | | | |
| 270 MHz ≤ f ≤ 780 MHz | | -36 dBm +TT | | 100 kHz | |  | |
| 1515 MHz ≤ f ≤ 2490 MHz 4815 MHz ≤ f ≤ 6690 MHz 6720 MHz ≤ f ≤ 7770 MHz 8310 MHz ≤ f ≤ 10185 MHz | | -30 dBm +TT | | 1 MHz | |  | |
| Test requirements for CA\_n3A-n78A Configuration | | | | | | | |
| 270 MHz ≤ f ≤ 380 MHz | | -36 dBm+TT | | 100 kHz | |  | |
| 1515MHz ≤ f ≤ 2090 MHz 4815 MHz ≤ f ≤ 5890 MHz 6720 MHz ≤ f ≤ 7370 MHz 8310 MHz ≤ f ≤ 9385 MHz | | -30 dBm+TT | | 1 MHz | |  | |
| **Test requirements for CA\_n5A-n48A** **Configuration** | | | | | | | |
| 1852 MHz ≤ f ≤ 2052 MHz 2701 MHz ≤ f ≤ 2876 MHz 4374 MHz ≤ f ≤ 4549 MHz 5198 MHz ≤ f ≤ 5398 MHz 6251 MHz ≤ f ≤ 6576 MHz 7924 MHz ≤ f ≤ 8249 MHz | | -30 dBm | | 1 MHz | |  | |
| Test requirements for CA\_n5A-n66A Configuration | | | | | | | |
| 12 MHz ≤ f ≤ 30 MHz | | -36 dBm+TT | | 10 kHz | |  | |
| 30 MHz ≤ f ≤ 132 MHz  861 MHz ≤ f ≤ 956 MHz | | -36 dBm+TT | | 100 kHz | |  | |
| 2534 MHz ≤ f ≤ 2736 MHz  3358 MHz ≤ f ≤ 3478 MHz  4244 MHz ≤ f ≤ 4409 MHz | | -30 dBm+TT | | 1 MHz | |  | |
| **Test requirements for CA\_n5A-n77A Configuration** | | | | | | | |
| 1602 MHz ≤ f ≤ 3376 MHz 4124 MHz ≤ f ≤ 5898 MHz 5751 MHz ≤ f ≤ 9249 MHz | | -30 dBm +TT | | 1 MHz | |  | |
| Test requirements for CA\_n8A-n78A Configuration | | | | | | | |
| 1470 MHz ≤ f ≤ 2040 MHz 2385 MHz ≤ f ≤ 2920 MHz 4180 MHz ≤ f ≤4715 MHz 5060 MHz ≤ f ≤5630 MHz 5685 MHz ≤ f ≤6720 MHz 7480 MHz ≤ f ≤8515 MHz | | -30 dBm+TT | | 1 MHz | |  | |
| **Test requirements for CA\_n14A-n30A Configuration** | | | | | | | | |
| 709 MHz ≤ f ≤ 739 MHz | | | -36 dBm+TT | | 100 kHz | |  | |
| 1507 MHz ≤ f ≤ 1527 MHz  2093 MHz ≤ f ≤ 3113 MHz  3812 MHz ≤ f ≤ 3842 MHz  3881 MHz ≤ f ≤ 3911 MHz | | | -30 dBm+TT | | 1 MHz | |  | |
| **Test requirements for CA\_n14A-n66A Configuration** | | | | | | | | |
| 114 MHz ≤ f ≤ 204 MHz  912 MHz ≤ f ≤ 992 MHz | | | -36 dBm+TT | | 100 kHz | |  | |
| 2498 MHz ≤ f ≤ 2578 MHz  2622 MHz ≤ f ≤ 2772 MHz  3286 MHz ≤ f ≤ 3376 MHz  4208 MHz ≤ f ≤ 4358 MHz | | | -30 dBm+TT | | 1 MHz | |  | |
| **Test requirements for CA\_n14A-n77A Configuration** | | | | | | | | |
| 1704 MHz ≤ f ≤ 3412 MHz  4088 MHz ≤ f ≤ 5796 MHz  5808 MHz ≤ f ≤ 9198 MHz | | | -30 dBm +TT | | 1 MHz | |  | |
| Test requirements for CA\_n20A-n78A Configuration | | | | | | | |
| 1576 MHz ≤ f ≤ 2136 MHz  2438 MHz ≤ f ≤ 2968 MHz  4132 MHz ≤ f ≤ 4662 MHz  4964 MHz ≤ f ≤ 5524 MHz  5738 MHz ≤ f ≤ 6768 MHz  7432 MHz ≤ f ≤ 8462 MHz | | -30 dBm+TT | | 1 MHz | |  | |
| Test requirements for CA\_n24A-n41A Configuration | | | | | | | |
| 563 MHz ≤ f ≤ 825 MHz  835.5 MHz ≤ f ≤ 1000 MHz | | -36 dBm+TT | | 100 kHz | |  | |
| 1000 MHz ≤ f ≤ 1063.5 MHz  3331.5 MHz ≤ f ≤ 3753.5 MHz  4122.5 MHz ≤ f ≤ 4350.5 MHz  5749 MHz ≤ f ≤ 6011 MHz  6618.5 MHz ≤ f ≤ 7040.5 MHz | | -25 dBm+TT | | 1 MHz | | NS-01 signalled for n41 | |
| -30 dBm+TT | | 1 MHz | | NS-04 signalled for n41 | |
| Test requirements for CA\_n24A-n48A Configuration | | | | | | | |
| 229 MHz ≤ f ≤ 447 MHz | | -36 dBm+TT | | 100 kHz | |  | |
| 1889.5 MHz ≤ f ≤ 2073.5 MHz  5176.5 MHz ≤ f ≤ 5360.5 MHz  5439.5 MHz ≤ f ≤ 5773.5 MHz  6803 MHz ≤ f ≤ 7021 MHz  8726.5 MHz ≤ f ≤ 9060.5 MHz | | -30 dBm+TT | | 1 MHz | |  | |
| Test requirements for CA\_n24A-n77A Configuration | | | | | | | |
| 21 MHz ≤ f < 30 MHz | | -36 dBm+TT | | 10 kHz | |  | |
| 30 MHz ≤ f < 947 MHz | | -36 dBm+TT | | 100 kHz | |  | |
| 1639.5 MHz ≤ f ≤ 2573.5 MHz  4926.5 MHz ≤ f ≤ 7521 MHz  8226.5 MHz ≤ f ≤ 10060.5 MHz | | -30 dBm+TT | | 1 MHz | |  | |
| |  |  |  |  | | --- | --- | --- | --- | | Test requirements for CA\_n25A-n66A Configuration | | | | | 70 MHz ≤ f ≤ 205 MHz | -36 dBm+TT | 100 kHz |  | | 1505 MHz ≤ f ≤ 1710 MHz  1920 MHz ≤ f ≤ 2120 MHz  3560 MHz ≤ f ≤ 3695 MHz  5270 MHz ≤ f ≤ 5610 MHz | -30 dBm+TT | 1 MHz |  | | Test requirements for CA\_n25A-n77A Configuration | | | | | 500 MHz ≤ f ≤ 530 MHz | -36 dBm+TT | 100 kHz |  | | 1385 MHz ≤ f ≤ 2350 MHz  4685 MHz ≤ f ≤ 6550 MHz  7000 MHz ≤ f ≤ 8030 MHz  8450 MHz ≤ f ≤ 10315 MHz | -30 dBm+TT | 1 MHz |  | | Test requirements for CA\_n25A-n78A Configuration | | | | | 100 MHz ≤ f ≤ 530 MHz | -36 dBm+TT | 100 kHz |  | | 1385 MHz ≤ f ≤ 1950 MHz  4685 MHz ≤ f ≤ 5750 MHz  7000 MHz ≤ f ≤ 7630 MHz  8450 MHz ≤ f ≤ 9515 MHz | -30 dBm+TT | 1 MHz |  | | | | | | | | |
| **Test requirements for CA\_n26A-n66A Configuration** | | | | | | | |
| 12 MHz ≤ f < 30 MHz | | -36 dBm+TT | | 10 kHz | |  | |
| 30 MHz ≤ f ≤ 152 MHz  861 MHz ≤ f ≤ 966 MHz | | -36 dBm+TT | | 100 kHz | |  | |
| 2524 MHz ≤ f ≤ 2746 MHz  3338 MHz ≤ f ≤ 3478 MHz  4234 MHz ≤ f ≤ 4409 MHz | | -30 dBm+TT | | 1 MHz | |  | |
| **Test requirements for CA\_n26A-n70A Configuration** | | | | | | | |
| 3 MHz ≤ f < 30 MHz | | -36 dBm+TT | | 10 kHz | |  | |
| 30 MHz ≤ f < 82 MHz | | -36 dBm+TT | | 100 kHz | |  | |
| 846 MHz ≤ f ≤ 896 MHz | | -36 dBm+TT | | 100 kHz | |  | |
| 2509 MHz ≤ f ≤ 2606 MHz  3323 MHz ≤ f ≤ 3408 MHz  4204 MHz ≤ f ≤ 4269 MHz | | -30 dBm+TT | | 1 MHz | |  | |
| Test requirements for CA\_n28A-n41A Configuration | | | | | | | |
| 1000MHz ≤ f ≤ 1284 MHz  1748MHz ≤ f ≤ 1987 MHz  3199MHz ≤ f ≤ 3438 MHz  3902MHz ≤ f ≤ 4186 MHz  4244MHz ≤ f ≤ 4677 MHz  5695MHz ≤ f ≤ 6128MHz | | -25 dBm+TT | | 1MHz | |  | |
| **Test requirements for CA\_n28A-n77A Configuration** | | | | | | | |
| 1804 MHz ≤ f ≤ 3497 MHz  4003 MHz ≤ f ≤ 5696 MHz  5852 MHz ≤ f ≤ 9148 MHz | | -30 dBm+TT | | 1 MHz | |  | |
| Test requirements for CA\_n28A-n78A Configuration | | | | | | | |
| 1804 MHz ≤ f ≤ 2394 MHz  2552 MHz ≤ f ≤ 3097 MHz  4003 MHz ≤ f ≤ 4548 MHz  4706 MHz ≤ f ≤ 5296 MHz  5852 MHz ≤ f ≤ 6897 MHz  7303 MHz ≤ f ≤ 8348 MHz | | -30 dBm+TT | | 1 MHz | |  | |
| Test requirements for CA\_n28A-n79A Configuration | | | | | | | |
| 2904 MHz ≤ f ≤ 3594 MHz  3652 MHz ≤ f ≤ 4297 MHz  5103 MHz ≤ f ≤ 5748 MHz  5806 MHz ≤ f ≤ 6496 MHz  8052 MHz ≤ f ≤ 9297 MHz  9503 MHz ≤ f ≤ 10748 MHz | | -30 dBm+TT | | 1 MHz | |  | |
| **Test requirements for CA\_n39A-n41A Configuration** | | | | | | | |
| 576 MHz ≤ f ≤ 810 MHz | | -36 dBm+TT | | 100 kHz | |  | |
| 1070 MHz ≤ f ≤ 1344 MHz  3072 MHz ≤ f ≤ 3500 MHz  4376 MHz ≤ f ≤ 4610 MHz  6256 MHz ≤ f ≤ 6530 MHz  6872 MHz ≤f ≤7300 MHz | | -30 dBm+TT | | 1 MHz | | 4 | |
|  | | -25 dBm +TT | | 1MHz | | 3 | |
| **Test requirements for CA\_n41A-n77A Configuration** | | | | | | | |
| 610 MHz ≤ f ≤ 1000 MHz | | -36  dBm+TT | | 100kHz | |  | |
| 1000 MHz ≤ f ≤ 2080 MHz  3910 MHz ≤ f ≤ 6890 MHz  8292 MHz ≤ f ≤ 11090 MHz | | -30  dBm+TT | | 1MHz | |  | |
| Test requirements for CA\_n41A-n79A Configuration | | | | | | | |
| 8 MHz ≤ f ≤30 MHz | | -36 dBm+TT | | 10kHz | |  | |
| 30 MHz ≤ f ≤980 MHz | | -36 dBm+TT | | 100kHz | |  | |
| 1710MHz ≤ f ≤ 2504MHz | | -30 dBm+TT | | 1MHz | |  | |
| 6110MHz ≤ f ≤ 7690MHz | |
| 9392MHz ≤ f ≤ 10380MHz | |
| 11296MHz ≤ f ≤ 12690MHz | |
| **Test requirements for CA\_n48A-n66A Configuration** | | | | | | | |
| 10 MHz ≤ f < 30 MHz | | -36 dBm+TT | | 10 kHz | |  | |
| 30 MHz ≤ f < 280 MHz | | -36 dBm+TT | | 100 kHz | |  | |
| 1770 MHz ≤ f ≤ 1990 MHz  5260 MHz ≤ f ≤ 5690 MHz  6970 MHz ≤ f ≤ 7260 MHz  8810 MHz ≤ f ≤ 9180 MHz | | -30 dBm+TT | | 1 MHz | |  | |
| Test requirements for CA\_n48A-n70A Configuration | | | | | | | |
| 130 MHz ≤ f ≤ 310 MHz | | -36 dBm+TT | | 100 kHz | |  | |
| 1840 MHz ≤ f ≤ 2005 MHz 5245 MHz ≤ f ≤ 5705 MHz 6940 MHz ≤ f ≤ 7120 MHz 8795 MHz ≤ f ≤ 9110 MHz | | -30 dBm+TT | | 1 MHz | |  | |
| **Test requirements for CA\_n48A-n71A Configuration** | | | | | | | |
| 2154 MHz ≤ f ≤ 2374 MHz  2852 MHz ≤ f ≤ 3037 MHz  4213 MHz ≤ f ≤ 4398 MHz  4876 MHz ≤ f ≤ 5096 MHz  6402 MHz ≤ f ≤ 6737 MHz  7763 MHz ≤ f ≤ 8098 MHz | | -30 dBm+TT | | 1 MHz | |  | |
| **Test requirements for CA\_n66A-n71A Configuration** | | | | | | | |
| 314 MHz ≤ f < 454 MHz | | -36 dBm+TT | | 100 kHz | |  | |
| 1012 MHz ≤ f ≤ 1117 MHz  2373 MHz ≤ f ≤ 2478 MHz  2722 MHz ≤ f ≤ 2897 MHz  3036 MHz ≤ f ≤ 3176 MHz  4083 MHz ≤ f ≤ 4258 MHz | | -30 dBm+TT | | 1 MHz | |  | |
| **Test requirements for CA\_n66A-n77A Configuration** | | | | | | | |
| 260 MHz ≤ f ≤ 780 MHz | | -36 dBm +TT | | 100 kHz | |  | |
| 1520 MHz ≤ f ≤ 2490 MHz 4820 MHz ≤ f ≤ 6690 MHz 6720 MHz ≤ f ≤ 7760 MHz 8310 MHz ≤ f ≤ 10180 MHz | | -30 dBm +TT | | 1 MHz | |  | |
| **Test requirements for CA\_n66A-n78A Configuration** | | | | | | | |
| 260 MHz ≤ f ≤ 380 MHz | | -36 dBm +TT | | 100 kHz | |  | |
| 1520 MHz ≤ f ≤ 2090 MHz  4820 MHz ≤ f ≤ 5890 MHz  6720 MHz ≤ f ≤ 7360 MHz  8310 MHz ≤ f ≤ 9380 MHz | | -30 dBm +TT | | 1 MHz | |  | |
| **Test requirements for CA\_n70A-n71A Configuration** | | | | | | | |
| 299 MHz ≤ f < 384 MHz  997 MHz ≤ f < 1000 MHz | | -36 dBm+TT | | 100 kHz | |  | |
| 1000 MHz ≤ f ≤ 1047 MHz  2358 MHz ≤ f ≤ 2408 MHz  2692 MHz ≤ f ≤ 2757 MHz  3021 MHz ≤ f ≤ 3106 MHz  4053 MHz ≤ f ≤ 4118 MHz | | -30 dBm+TT | | 1 MHz | |  | |
| **Test requirements for CA\_n71A-n77A Configuration** | | | | | | | |
| 1904 MHz ≤ f ≤ 3537 MHz  3963 MHz ≤ f ≤ 5596 MHz  5902 MHz ≤ f ≤ 9098 MHz | | -30 dBm+TT | | 1 MHz | |  | |
| **Test requirements for CA\_n71A-n78A Configuration** | | | | | | | |
| 1904 MHz ≤ f ≤ 2474 MHz  2602 MHz ≤ f ≤ 3137 MHz  3963 MHz ≤ f ≤ 4498 MHz  4626 MHz ≤ f ≤ 5196 MHz  5902 MHz ≤ f ≤ 6937 MHz  7263 MHz ≤ f ≤ 8298 MHz | | -30 dBm+TT | | 1 MHz | |  | |
| NOTE 1: Applies for Band for which the upper frequency edge of the UL Band is greater than 2.55 GHz and less than or equal to 5.2 GHz  NOTE 2: Applies for Band that the upper frequency edge of the UL Band more than 5.2 GHz  NOTE 3: Applies for Band n41, CA configurations including Band n41, and EN-DC configurations that include n41 specified in clause 5.2B of TS 38.101-3 [4] when NS\_04 is signalled.  NOTE 4: Does not apply for Band n41, CA configurations including Band n41, and EN-DC configurations that include n41 specified in subclause 5.2B of TS 38.101-3 [4] when NS\_04 is signalled. | | | | | | | |

Table 6.5A.3.1.1.5-2: Test Tolerance for General spurious emissions

|  |  |  |
| --- | --- | --- |
|  | f ≤ 3.0GHz | 3.0GHz < f ≤ 6GHz |
| BW ≤ 40MHz | 0 | 0 |
| 40MHz < BW ≤ 100MHz | 0 | 0 |

Table 6.5A.3.1.1.5-3: General spurious emissions test requirements for intra-band contiguous and non-contiguous UL CA

|  |  |  |  |
| --- | --- | --- | --- |
| Frequency Range | Maximum Level | Measurement bandwidth | NOTE |
| 9 kHz ≤ f < 150 kHz | -36 dBm | 1 kHz |  |
| 150 kHz ≤ f < 30 MHz | -36 dBm | 10 kHz |  |
| 30 MHz ≤ f < 1000 MHz | -36 dBm | 100 kHz |  |
| 1 GHz ≤ f < 12.75 GHz | -30 dBm | 1 MHz | 4 |
| -25 dBm | 1 MHz | 3 |
| 12.75 GHz ≤ f < 5th harmonic of the upper frequency edge of the UL operating band in GHz | -30 dBm | 1 MHz | 1 |
| 12.75 GHz < f < 26 GHz | -30 dBm | 1 MHz | 2 |
| NOTE 1: Applies for Band for which the upper frequency edge of the UL Band is greater than 2.55 GHz and less than or equal to 5.2 GHz  NOTE 2: Applies for Band that the upper frequency edge of the UL Band more than 5.2 GHz  NOTE 3: Applies for Band n41, CA configurations including Band n41, and EN-DC configurations that include n41 specified in sub-clause 5.2B of [4] when NS\_04 is signalled.  NOTE 4: Does not apply for Band n41, CA configurations including Band n41, and EN-DC configurations that include n41 specified in subclause 5.2B of TS 38.101-3 [4] when NS\_04 is signalled. | | | |

#### 6.5A.3.2 Spurious emission for UE co-existence

##### 6.5A.3.2.0 Minimum conformance requirements

###### 6.5A.3.2.0.0 General

Unless otherwise stated, the spurious emission for UE co-existence apply for the frequency ranges that are more than FOOB (MHz) in Table 6.5.3.1.3-1 from the edge of the channel bandwidth configured on each component carrier.

###### 6.5A.3.2.0.1 Spurious emissions for UE co-existence for intra-band contiguous CA

This clause specifies the requirements for the specified intra-band contiguous carrier aggregation configurations for coexistence with protected bands, the requirements in Tables 6.5A.3.2.0.1-1 to Table 6.5A.3.2.0.1-3 apply. For power class 2 intra-band contiguous carrier aggregation, the spurious emissions is measured as the sum from both UE transmit antenna connectors when UE indicates support for *dualPA-Architecture* IE..

NOTE: For measurement conditions at the edge of each frequency range, the lowest frequency of the measurement position in each frequency range should be set at the lowest boundary of the frequency range plus MBW/2. The highest frequency of the measurement position in each frequency range should be set at the highest boundary of the frequency range minus MBW/2. MBW denotes the measurement bandwidth defined for the protected band.

Table 6.5A.3.2.0.1-1: Requirements for uplink intra-band contiguous carrier aggregation (Rel-16)

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| NR CA combination | Spurious emission | | | | | | |
| Protected Band | Frequency range (MHz) | | | Maximum Level (dBm) | MBW (MHz) | NOTE |
| CA\_n7 | E-UTRA Band 1, 2, 3, 4, 5, 7, 8, 12, 13, 14, 17, 20, 22, 26, 27, 28, 29, 30, 31, 32, 33, 34, 40, 42, 43, 50, 51, 52, 65, 66, 67, 68, 72, 74, 75, 76, 85,  NR Band n77, n78 | FDL\_low | - | FDL\_high | -50 | 1 |  |
| CA\_n41 | E-UTRA Band 1, 2, 3, 4, 5, 8, 12, 13, 14, 17, 24, 25, 26, 27, 28, 29, 30, 34, 39, 42, 44, 45, 48, 50, 51, 52, 65, 66, 70, 71, 73, 74, 85,  NR Band n77, n78 | FDL\_low | - | FDL\_high | -50 | 1 |  |
| NR Band n79 | FDL\_low | - | FDL\_high | -50 | 1 | 2, 4 |
| E-UTRA Band 9, 11, 18, 19, 21 | FDL\_low | - | FDL\_high | -50 | 1 | 6 |
| E-UTRA Band 40 | FDL\_low | - | FDL\_high | -40 | 1 |  |
| Frequency range | 1884.5 |  | 1915.7 | -41 | 0.3 | 5, 6 |
| CA\_n48 | E-UTRA Band 2, 4, 5, 12, 13, 14, 17, 24, 25, 26, 29, 30, 41, 50, 51, 66, 70, 71, 74, 85 | FDL\_low | - | FDL\_high | -50 | 1 |  |
| CA\_n77 | E-UTRA Band 1, 3, 5, 7, 8, 11, 18, 19, 20, 21, 26, 28, 34, 39, 40, 41, 65 | FDL\_low | - | FDL\_high | -50 | 1 |  |
| Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 5 |
| CA\_n78 | E-UTRA Band 1, 3, 5, 7, 8, 11, 18, 19, 20, 21, 26, 28, 34, 39, 40, 41, 65 | FDL\_low | - | FDL\_high | -50 | 1 |  |
| Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 5 |
| CA\_n79 | E-UTRA Band 1, 3, 5, 8, 11, 18, 19, 21, 28, 34, 39, 40, 41, 42, 65 | FDL\_low | - | FDL\_high | -50 | 1 |  |
| Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 5 |
| NOTE 1: Void.  NOTE 2: Void.  NOTE 3: Void.  NOTE 4: As exceptions, measurements with a level up to the applicable requirements defined in Table 6.5.3.1-2 are permitted for each assigned NR carrier used in the measurement due to 2nd, 3rd, 4th or 5th harmonic spurious emissions. Due to spreading of the harmonic emission the exception is also allowed for the first 1 MHz frequency range immediately outside the harmonic emission on both sides of the harmonic emission. This results in an overall exception interval centred at the harmonic emission of (2 MHz + N x LCRB x RBsize kHz), where N is 2, 3, 4, 5 for the 2nd, 3rd, 4th or 5th harmonic respectively. The exception is allowed if the measurement bandwidth (MBW) totally or partially overlaps the overall exception interval.  NOTE 5: Applicable when co-existence with PHS system operating in 1884.5 - 1915.7 MHz.  NOTE 6: This requirement applies when the NR carrier is confined within 2545 – 2575 MHz or 2595 – 2645 MHz and the channel bandwidth is 10 or 20 MHz | | | | | | | |

Table 6.5A.3.2.0.1-2: Requirements for uplink intra-band contiguous carrier aggregation (Rel-17)

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| NR CA combination | Spurious emission | | | | | | |
|  | Protected Band | Frequency range (MHz) | | | Maximum Level (dBm) | MBW (MHz) | NOTE |
| CA\_n7 | E-UTRA Band 1, 2, 3, 4, 5, 7, 8, 12, 13, 14, 17, 20, 22, 26, 27, 28, 29, 30, 31, 32, 33, 34, 40, 42, 43, 50, 51, 52, 65, 66, 67, 68, 72, 74, 75, 76, 85, 103  NR Band n77, n78, n100 | FDL\_low | - | FDL\_high | -50 | 1 |  |
| CA\_n40 | E-UTRA Band 1, 3, 5, 7, 8, 11, 18, 19, 20, 21, 22, 26, 27, 28, 31, 32, 33, 34, 38, 39, 41, 42, 43, 44, 45, 50, 51, 52, 65, 67, 68, 69, 72, 74, 75, 76,  NR Band n77, n78, n100 | FDL\_low | - | FDL\_high | -50 | 1 | 7 |
|  | NR Band n79 | FDL\_low | - | FDL\_high | -50 | 1 | 2, 4 |
|  | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 5 |
| CA\_n41 | E-UTRA Band 1, 2, 3, 4, 5, 8, 12, 13, 14, 17, 24, 25, 26, 27, 28, 29, 30, 34, 39, 42, 44, 45, 48, 50, 51, 52, 65, 66, 70, 71, 73, 74, 85, 103  NR Band n77, n78, n100 | FDL\_low | - | FDL\_high | -50 | 1 |  |
|  | NR Band n79 | FDL\_low | - | FDL\_high | -50 | 1 | 2, 4 |
|  | E-UTRA Band 9, 11, 18, 19, 21 | FDL\_low | - | FDL\_high | -50 | 1 | 6 |
|  | E-UTRA Band 40 | FDL\_low | - | FDL\_high | -40 | 1 |  |
|  | Frequency range | 1884.5 |  | 1915.7 | -41 | 0.3 | 5, 6 |
| CA\_n48 | E-UTRA Band 2, 4, 5, 12, 13, 14, 17, 24, 25, 26, 29, 30, 41, 50, 51, 66, 70, 71, 74, 85, 103 | FDL\_low | - | FDL\_high | -50 | 1 |  |
| CA\_n77 | E-UTRA Band 1, 3, 5, 7, 8, 11, 18, 19, 20, 21, 26, 28, 34, 39, 40, 41, 65, n100 | FDL\_low | - | FDL\_high | -50 | 1 |  |
|  | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 5 |
| CA\_n78 | E-UTRA Band 1, 3, 5, 7, 8, 11, 18, 19, 20, 21, 26, 28, 34, 39, 40, 41, 65, n100 | FDL\_low | - | FDL\_high | -50 | 1 |  |
|  | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 5 |
| CA\_n79 | E-UTRA Band 1, 3, 5, 8, 11, 18, 19, 21, 28, 34, 39, 40, 41, 42, 65 | FDL\_low | - | FDL\_high | -50 | 1 |  |
|  | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 5 |
| NOTE 1: Void  NOTE 2: Void  NOTE 3: Void  NOTE 4: As exceptions, measurements with a level up to the applicable requirements defined in Table 6.5.3.1-2 are permitted for each assigned NR carrier used in the measurement due to 2nd, 3rd, 4th or 5th harmonic spurious emissions. Due to spreading of the harmonic emission the exception is also allowed for the first 1 MHz frequency range immediately outside the harmonic emission on both sides of the harmonic emission. This results in an overall exception interval centred at the harmonic emission of (2 MHz + N x LCRB x RBsize kHz), where N is 2, 3, 4, 5 for the 2nd, 3rd, 4th or 5th harmonic respectively. The exception is allowed if the measurement bandwidth (MBW) totally or partially overlaps the overall exception interval.  NOTE 5: Applicable when co-existence with PHS system operating in 1884.5 - 1915.7 MHz.  NOTE 6: This requirement applies when the NR carrier is confined within 2545 – 2575 MHz or 2595 – 2645 MHz and the channel bandwidth is 10 or 20 MHz  NOTE 7: As exceptions, for 90 and 100 MHz aggregated bandwidth, -40 dBm/MHz is applicable in the frequency range of 2496 – 2505 MHz. | | | | | | | |

Table 6.5A.3.2.0.1-3: Requirements for uplink intra-band contiguous carrier aggregation (Rel-18)

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| NR CA combination | Spurious emission | | | | | | |
|  | Protected Band | Frequency range (MHz) | | | Maximum Level (dBm) | MBW (MHz) | NOTE |
| CA\_n7 | E-UTRA Band 1, 2, 3, 4, 5, 7, 8, 12, 13, 14, 17, 20, 22, 26, 27, 28, 29, 30, 31, 32, 33, 34, 40, 42, 43, 50, 51, 52, 65, 66, 67, 68, 72, 74, 75, 76, 85, 103  NR Band n77, n78, n100 | FDL\_low | - | FDL\_high | -50 | 1 |  |
| CA\_n40 | E-UTRA Band 1, 3, 5, 7, 8, 11, 18, 19, 20, 21, 22, 26, 27, 28, 31, 32, 33, 34, 38, 39, 41, 42, 43, 44, 45, 50, 51, 52, 65, 67, 68, 69, 72, 74, 75, 76,  NR Band n77, n78, n100 | FDL\_low | - | FDL\_high | -50 | 1 | 7 |
|  | NR Band n79 | FDL\_low | - | FDL\_high | -50 | 1 | 2, 4 |
|  | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 5 |
| CA\_n41 | E-UTRA Band 1, 2, 3, 4, 5, 8, 12, 13, 14, 17, 24, 25, 26, 27, 28, 29, 30, 34, 39, 42, 44, 45, 48, 50, 51, 52, 54, 65, 66, 70, 71, 73, 74, 85, 103  NR Band n77, n78, n100 | FDL\_low | - | FDL\_high | -50 | 1 |  |
|  | NR Band n79 | FDL\_low | - | FDL\_high | -50 | 1 | 2, 4 |
|  | E-UTRA Band 9, 11, 18, 19, 21 | FDL\_low | - | FDL\_high | -50 | 1 | 6 |
|  | E-UTRA Band 40 | FDL\_low | - | FDL\_high | -40 | 1 |  |
|  | Frequency range | 1884.5 |  | 1915.7 | -41 | 0.3 | 5, 6 |
| CA\_n48 | E-UTRA Band 2, 4, 5, 12, 13, 14, 17, 24, 25, 26, 29, 30, 41, 50, 51, 54, 66, 70, 71, 74, 85, 103 | FDL\_low | - | FDL\_high | -50 | 1 |  |
| CA\_n77 | E-UTRA Band 1, 3, 5, 7, 8, 11, 18, 19, 20, 21, 26, 28, 34, 39, 40, 41, 54, 65, n100 | FDL\_low | - | FDL\_high | -50 | 1 |  |
|  | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 5 |
| CA\_n78 | E-UTRA Band 1, 3, 5, 7, 8, 11, 18, 19, 20, 21, 26, 28, 34, 39, 40, 41, 65, n100 | FDL\_low | - | FDL\_high | -50 | 1 |  |
|  | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 5 |
| CA\_n79 | E-UTRA Band 1, 3, 5, 8, 11, 18, 19, 21, 28, 34, 39, 40, 41, 42, 65 | FDL\_low | - | FDL\_high | -50 | 1 |  |
|  | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 5 |
| NOTE 1: Void  NOTE 2: Void  NOTE 3: Void  NOTE 4: As exceptions, measurements with a level up to the applicable requirements defined in Table 6.5.3.1-2 are permitted for each assigned NR carrier used in the measurement due to 2nd, 3rd, 4th or 5th harmonic spurious emissions. Due to spreading of the harmonic emission the exception is also allowed for the first 1 MHz frequency range immediately outside the harmonic emission on both sides of the harmonic emission. This results in an overall exception interval centred at the harmonic emission of (2 MHz + N x LCRB x RBsize kHz), where N is 2, 3, 4, 5 for the 2nd, 3rd, 4th or 5th harmonic respectively. The exception is allowed if the measurement bandwidth (MBW) totally or partially overlaps the overall exception interval.  NOTE 5: Applicable when co-existence with PHS system operating in 1884.5 - 1915.7 MHz.  NOTE 6: This requirement applies when the NR carrier is confined within 2545 – 2575 MHz or 2595 – 2645 MHz and the channel bandwidth is 10 or 20 MHz  NOTE 7: As exceptions, for 90 and 100 MHz aggregated bandwidth, -40 dBm/MHz is applicable in the frequency range of 2496 – 2505 MHz. | | | | | | | |

###### 6.5A.3.2.0.2 Void

###### 6.5A.3.2.0.2a Spurious emissions for UE co-existence for Intra-band non-contiguous CA

This clause specifies the requirements for the specified intra-band non-contiguous carrier aggregation configurations for coexistence with protected bands, the requirements in Table 6.5A.3.2.0.2a-1 apply.

NOTE: For measurement conditions at the edge of each frequency range, the lowest frequency of the measurement position in each frequency range should be set at the lowest boundary of the frequency range plus MBW/2. The highest frequency of the measurement position in each frequency range should be set at the highest boundary of the frequency range minus MBW/2. MBW denotes the measurement bandwidth defined for the protected band.

Table 6.5A.3.2.0.2a-1: Requirements for uplink intra-band non-contiguous carrier aggregation

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| NR CA combination | Spurious emission | | | | | | |
|  | Protected Band | Frequency range (MHz) | | | Maximum Level (dBm) | MBW (MHz) | NOTE |
| CA\_n77 | E-UTRA Band 1, 3, 5, 7, 8, 11, 18, 19, 20, 21, 26, 28, 34, 39, 40, 41, 65 | FDL\_low | - | FDL\_high | -50 | 1 |  |
| CA\_n78 | E-UTRA Band 1, 3, 5, 7, 8, 11, 18, 19, 20, 21, 26, 28, 34, 39, 40, 41, 65  NR Band n101 | FDL\_low | - | FDL\_high | -50 | 1 |  |
| NOTE 1: FFS  NOTE 2: FFS | | | | | | | |

###### 6.5A.3.2.0.3 Spurious emissions for UE co-existence for Inter-band CA

This clause specifies the additional requirements for inter-band uplink carrier aggregation configurations with the single CC uplink assigned to two NR bands for coexistence with protected bands for the specified uplink carrier aggregation configurations in Table 6.5A.3.2.0.3-1 to Table 6.5A.3.2.0.3-4. The intersection of the requirements for the individual bands specified in clause 6.5.3.2 shall also apply for the specified uplink carrier aggregation configurations. Intersection of a requirement means that both UL constituent bands have the same protected band requirement specified and if one or both protected bands have note(s) associated those note(s) also apply.

For inter-band carrier aggregation with two contiguous carriers assigned to one NR band, the requirements in subclause 6.5A.3.2.0.1 apply for that band.

For inter-band carrier aggregation with two uplink non-contiguous carrier assigned to one NR band, the spurious emissions for UE co-existence requirements in subclause 6.5A.3.2.0.2a apply for that band.

For inter-band carrier aggregation with the uplink assigned to two NR bands, the requirements in Table 6.5A.3.2.0.3-1 to 6.5A.3.2.0.3-4 apply on each component carrier with all component carriers are active.

NOTE: For inter-band carrier aggregation with single CC uplink assigned to two NR bands, the requirements in Tables 6.5A.3.2.0.3-1 to 6.5A.3.2.0.3-4 could be verified by measuring spurious emissions at the specific frequencies where second and third order intermodulation products generated by the two transmitted carriers can occur; in that case, the requirements for remaining applicable frequencies in Tables 6.5A.3.2.0.3-1 to Table 6.5A.3.2.0.3-4 and in clause 6.5.3.2 would be considered to be verified by the measurements verifying the one uplink inter-band CA UE to UE co-existence requirements.

Table 6.5A.3.2.0.3-1: Requirements for uplink inter-band carrier aggregation (two bands) Rel-15

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| NR CA combination | Spurious emission | | | | | | |
| Protected Band | Frequency range (MHz) | | | Maximum Level (dBm) | MBW (MHz) | NOTE |
|  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| CA\_n3-n78 | E-UTRA Band 1, 3, 5, 7, 8, 11, 18, 19, 20, 21, 26, 28, 34, 39, 40, 41, 65, 74 | FDL\_low | - | FDL\_high | -50 | 1 |  |
| Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 3 |
| CA\_n8-n78 | E-UTRA Band 1, 8, 11, 20, 21, 28, 34, 39, 40, 65, 74 | FDL\_low | - | FDL\_high | -50 | 1 |  |
| E-UTRA Band 3, 7, 41 | FDL\_low | - | FDL\_high | -50 | 1 | 2 |
| Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 3 |
|  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| NOTE 1: FDL\_low and FDL\_high refer to each frequency band specified in Table 5.2-1 in TS 38.101-1 or Table 5.5-1 in TS 36.101  NOTE 2: As exceptions, measurements with a level up to the applicable requirements defined in Table 6.5.3.1-2 are permitted for each assigned NR carrier used in the measurement due to 2nd, 3rd, 4th or 5th harmonic spurious emissions. Due to spreading of the harmonic emission the exception is also allowed for the first 1 MHz frequency range immediately outside the harmonic emission on both sides of the harmonic emission. This results in an overall exception interval centred at the harmonic emission of (2 MHz + N x LCRB x 180kHz), where N is 2, 3, 4, 5 for the 2nd, 3rd, 4th or 5th harmonic respectively. The exception is allowed if the measurement bandwidth (MBW) totally or partially overlaps the overall exception interval.  NOTE 3: Applicable when co-existence with PHS system operating in 1884.5 -1915.7 MHz  NOTE 4: These requirements also apply for the frequency ranges that are less than FOOB (MHz) in Table 6.5.3.1-1 from the edge of the channel bandwidth.  NOTE 5: Void. | | | | | | | |

NOTE: To simplify Table 6.5A.3.2.0.3-1, E-UTRA band numbers are listed for bands which are specified only for E-UTRA operation or both E-UTRA and NR operation. NR band numbers are listed for bands which are specified only for NR operation.

Table 6.5A.3.2.0.3-2: Requirements for uplink inter-band carrier aggregation (two bands) Rel-16

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| NR CA Configuration | Spurious emission | | | | | | |
| Protected Band | Frequency range (Mhz) | | | Maximum Level (dBm) | MBW (MHz) | NOTE |
| CA\_n1-n28 | Frequency range | 470 | - | 694 | -42 | 8 | 4, 14 |
|  | Frequency range | 470 | - | 710 | -26.2 | 6 | 15 |
|  | Frequency range | 758 | - | 773 | -30 | 1 | 4 |
|  | Frequency range | 773 | - | 803 | -50 | 1 |  |
|  | Frequency range | 662 | - | 694 | -26.2 | 6 | 4 |
| CA\_n3-n28 | Frequency range | 470 | - | 694 | -42 | 8 | 4, 14 |
| Frequency range | 470 | - | 710 | -26.2 | 6 | 15 |
| Frequency range | 758 | - | 773 | -30 | 1 | 4 |
| Frequency range | 773 | - | 803 | -50 | 1 |  |
| Frequency range | 662 | - | 694 | -26.2 | 6 | 4 |
| Frequency range | 1839.9 | - | 1879.9 | -50 | 1 | 4 |
| Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 3, 11 |
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|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| CA\_n3-n41 | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 3 |
| CA\_n3-n77 | Same requirements as in Table 6.5A.3.2.0.3-1 | | | | | | |
| CA\_n3-n78 | Same requirements as in Table 6.5A.3.2.0.3-1 | | | | | | |
| CA\_n5-n77 | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 3 |
| CA\_n8-n78 | Same requirements as in Table 6.5A.3.2.0.3-1 | | | | | | |
| CA\_n28-n40 | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 3 |
| CA\_n28-n41 | Frequency range | 470 | - | 694 | -42 | 8 | 4, 14 |
|  | Frequency range | 470 | - | 710 | -26.2 | 6 | 13 |
|  | Frequency range | 662 | - | 694 | -26.2 | 6 | 4 |
|  | Frequency range | 758 | - | 773 | -32 | 1 | 4 |
|  | Frequency range | 773 | - | 803 | -50 | 1 |  |
|  | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 3, 11 |
| CA\_n41-n79 | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 3 |
| NOTE 1: Void.  NOTE 2: Void.  NOTE 3: Applicable when co-existence with PHS system operating in 1884.5 -1915.7MHz  NOTE 4: These requirements also apply for the frequency ranges that are less than FOOB (MHz) in Table 6.5.3.1-1 and Table 6.5A.3.1-1 from the edge of the channel bandwidth.  NOTE 5: Void.  NOTE 6: This requirement is applicable for any channel bandwidths within the range 1920 – 1980 MHz with the following restriction: for carriers of 15 MHz bandwidth when carrier centre frequency is within the range 1927.5 - 1929.5 MHz and for carriers of 20 MHz bandwidth when carrier centre frequency is within the range 1930 – 1938 MHz the requirement is applicable only for an uplink transmission bandwidth less than or equal to 54 RB.  NOTE 7: For these adjacent bands, the emission limit could imply risk of harmful interference to UE(s) operating in the protected operating band.  NOTE 8: This requirement is only applicable for carriers with bandwidth confined within 1885-1920 MHz (requirement for carriers with at least 1RB confined within 1880 - 1885 MHz is not specified). This requirement applies for an uplink transmission bandwidth less than or equal to 54 RB for carriers of 15 MHz bandwidth when carrier centre frequency is within the range 1892.5 - 1894.5 MHz and for carriers of 20 MHz bandwidth when carrier centre frequency is within the range 1895 - 1903 MHz.  NOTE 9: Void.  NOTE 10: Void.  NOTE 11:Applicable when the assigned NR carrier is confined within 718 MHz and 748 MHz and when the channel bandwidth used is 5 or 10 MHz.  NOTE 12: Void.  NOTE 13: This requirement is applicable for 5 and 10 MHz NR channel bandwidth allocated within 718 - 728 MHz. For carriers of 10 MHz bandwidth, this requirement applies for an uplink transmission bandwidth less than or equal to 30 RB with RBstart > 1 and Rbstart < 48.  NOTE 14: This requirement is applicable in the case of a 10 MHz NR carrier confined within 703 MHz and 733 MHz, otherwise the requirement of -25 dBm with a measurement bandwidth of 8 MHz applies.  NOTE 15: As exceptions, measurements with a level up to the applicable requirement of -36 dBm/MHz is permitted for each assigned E-UTRA carrier used in the measurement due to 3rd harmonic spurious emissions. An exception is allowed if there is at least one individual RB within the transmission bandwidth (see Figure 5.6-1) for which the 3rd harmonic totally or partially overlaps the measurement bandwidth (MBW). | | | | | | | |

Table 6.5A.3.2.0.3-3: Requirements for uplink inter-band carrier aggregation (two bands) Rel-17

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| NR CA Configuration | Spurious emission | | | | | | | |
| Protected Band | | Frequency range (Mhz) | | | Maximum Level (dBm) | MBW (MHz) | NOTE |
|  |  | |  |  |  |  |  |  |
|  | |  |  |  |  |  |  |
| CA\_n1-n28 | | Same requirements as in Table 6.5A.3.2.0.3-2 | | | | | | |
| CA\_n2-n14 | Frequency range | | 769 | - | 775 | -35 | 0.00625 | 4 |
| Frequency range | | 799 | - | 805 | -35 | 0.00625 | 4 |
| CA\_n3-n8 | Frequency range | | 1884.5 | - | FDL\_high | -41 | 0.3 | 3 |
| CA\_n3-n28 | Frequency range | | 470 | - | 694 | -42 | 8 | 4, 14 |
| Frequency range | | 470 | - | 710 | -26.2 | 6 | 15 |
| Frequency range | | 758 | - | 773 | -30 | 1 | 4 |
| Frequency range | | 773 | - | 803 | -50 | 1 |  |
| Frequency range | | 662 | - | 694 | -26.2 | 6 | 4 |
| Frequency range | | 1839.9 | - | 1879.9 | -50 | 1 | 4 |
| Frequency range | | 1884.5 | - | 1915.7 | -41 | 0.3 | 3, 11 |
|  |  | |  |  |  |  |  |  |
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|  | |  |  |  |  |  |  |
| CA\_n3-n28 | Same requirements as in Table 6.5A.3.2.0.3-2 | | | | | | | |
| CA\_n3-n41 | Frequency range | | 1884.5 | - | 1915.7 | -41 | 0.3 | 3 |
| CA\_n3-n77 | Frequency range | | 1884.5 | - | 1915.7 | -41 | 0.3 | 3 |
| CA\_n3-n78 | Frequency range | | 1884.5 | - | 1915.7 | -41 | 0.3 | 3 |
| CA\_n5-n48 | Frequency range | | 1884.5 | - | 1915.7 | -41 | 0.3 | 8 |
| CA\_n5-n66 | Frequency range | | 1884.5 | - | 1915.7 | -41 | 0.3 | 3 |
| CA\_n5-n77 | Frequency range | | 1884.5 | - | 1915.7 | -41 | 0.3 | 3 |
| CA\_n8-n78 | Frequency range | | 1884.5 | - | 1915.7 | -41 | 0.3 | 3 |
| CA\_n14-n30 | Frequency range | | 769 | - | 775 | -35 | 0.00625 | 4 |
| Frequency range | | 799 | - | 805 | -35 | 0.00625 | 4 |
| CA\_n14-n66 | Frequency range | | 769 | - | 775 | -35 | 0.00625 | 4 |
| Frequency range | | 799 | - | 805 | -35 | 0.00625 | 4 |
| CA\_n14-n77 | Frequency range | | 769 | - | 775 | -35 | 0.00625 | 4,20 |
| Frequency range | | 799 | - | 805 | -35 | 0.00625 | 4,20 |
| CA\_n26-n66 | Frequency range | | 1884.5 | - | 1915.7 | -41 | 0.3 | 3 |
| CA\_n26-n70 | Frequency range | | 1884.5 | - | 1915.7 | -41 | 0.3 | 3 |
| CA\_n28-n41 | Frequency range | | 470 | - | 694 | -42 | 8 | 4, 14 |
|  | Frequency range | | 470 | - | 710 | -26.2 | 6 | 13 |
|  | Frequency range | | 662 | - | 694 | -26.2 | 6 | 4 |
|  | Frequency range | | 758 | - | 773 | -32 | 1 | 4 |
|  | Frequency range | | 773 | - | 803 | -50 | 1 |  |
|  | Frequency range | | 1884.5 | - | 1915.7 | -41 | 0.3 | 3, 11 |
| CA\_n28-n77 | Frequency range | | 758 | - | 773 | -32 | 1 |  |
|  | Frequency range | | 773 | - | 803 | -50 | 1 |  |
|  | Frequency range | | 1884.5 | - | 1915.7 | -41 | 0.3 | 3, 11 |
| CA\_n28-n78 | Frequency range | | 758 | - | 773 | -32 | 1 |  |
|  | Frequency range | | 773 | - | 803 | -50 | 1 |  |
|  | Frequency range | | 1884.5 | - | 1915.7 | -41 | 0.3 | 3, 11 |
| CA\_n28-n79 | Frequency range | | 470 | - | 694 | -42 | 8 | 4, 14 |
|  | Frequency range | | 470 | - | 710 | -26.2 | 6 | 13 |
|  | Frequency range | | 662 | - | 694 | -26.2 | 6 | 4 |
|  | Frequency range | | 758 | - | 773 | -32 | 1 | 4 |
|  | Frequency range | | 773 | - | 803 | -50 | 1 |  |
|  | Frequency range | | 1884.5 | - | 1915.7 | -41 | 0.3 | 3, 10, 11 |
| CA\_n41-n77 | | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 3 |
| CA\_n41-n79 | Same requirements as in Table 6.5A.3.2.0.3-2 | | | | | | | |
| NOTE 1: Void.  NOTE 2: Void.  NOTE 3: Applicable when co-existence with PHS system operating in 1884.5 -1915.7MHz  NOTE 4: These requirements also apply for the frequency ranges that are less than FOOB (MHz) in Table 6.5.3.1-1 and Table 6.5A.3.1-1 from the edge of the channel bandwidth.  NOTE 5: Void.  NOTE 6: This requirement is applicable for any channel bandwidths within the range 1920 – 1980 MHz with the following restriction: for carriers of 15 MHz bandwidth when carrier centre frequency is within the range 1927.5 - 1929.5 MHz and for carriers of 20 MHz bandwidth when carrier centre frequency is within the range 1930 – 1938 MHz the requirement is applicable only for an uplink transmission bandwidth less than or equal to 54 RB.  NOTE 7: For these adjacent bands, the emission limit could imply risk of harmful interference to UE(s) operating in the protected operating band.  NOTE 8: This requirement is only applicable for carriers with bandwidth confined within 1885-1920 MHz (requirement for carriers with at least 1RB confined within 1880 - 1885 MHz is not specified). This requirement applies for an uplink transmission bandwidth less than or equal to 54 RB for carriers of 15 MHz bandwidth when carrier centre frequency is within the range 1892.5 - 1894.5 MHz and for carriers of 20 MHz bandwidth when carrier centre frequency is within the range 1895 - 1903 MHz.  NOTE 9: Void.  NOTE 10: Void.  NOTE 11:Applicable when the assigned NR carrier is confined within 718 MHz and 748 MHz and when the channel bandwidth used is 5 or 10 MHz.  NOTE 12: Void.  NOTE 13: This requirement is applicable for 5 and 10 MHz NR channel bandwidth allocated within 718 - 728 MHz. For carriers of 10 MHz bandwidth, this requirement applies for an uplink transmission bandwidth less than or equal to 30 RB with RBstart > 1 and Rbstart < 48.  NOTE 14: This requirement is applicable in the case of a 10 MHz NR carrier confined within 703 MHz and 733 MHz, otherwise the requirement of -25 dBm with a measurement bandwidth of 8 MHz applies.  NOTE 15: As exceptions, measurements with a level up to the applicable requirement of -36 dBm/MHz is permitted for each assigned E-UTRA carrier used in the measurement due to 3rd harmonic spurious emissions. An exception is allowed if there is at least one individual RB within the transmission bandwidth (see Figure 5.6-1) for which the 3rd harmonic totally or partially overlaps the measurement bandwidth (MBW).  NOTE 16: Void.  NOTE 17: Void  NOTE 18: Void  NOTE 19: Void  NOTE 20: Applicable for cases and when the lower edge of the assigned NR UL channel bandwidth frequency is greater than or equal to 1427 MHz + the channel BW assigned for 5 and 10 MHz bandwidth, and when the lower edge of the assigned NR UL channel bandwidth frequency is greater than or equal to 1440 MHz for 15 and 20 MHz bandwidth. | | | | | | | | |

Table 6.5A.3.2.0.3-4: Requirements for uplink inter-band carrier aggregation (two bands) Rel-18

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| NR CA Configuration | Spurious emission | | | | | | |
| Protected Band | Frequency range (Mhz) | | | Maximum Level (dBm) | MBW (MHz) | NOTE |
| CA\_n1-n28 | Same requirements as in Table 6.5A.3.2.0.3-2 | | | | | | |
| CA\_n2-n14 | Frequency range | 769 | - | 775 | -35 | 0.00625 | 4 |
| Frequency range | 799 | - | 805 | -35 | 0.00625 | 4 |
| CA\_n3-n28 |  |  |  |  |  |  |  |
| CA\_n3-n8 | Frequency range | 1884.5 | - | FDL\_high | -41 | 0.3 | 3 |
| CA\_n3-n28 | Same requirements as in Table 6.5A.3.2.0.3-2 | | | | | | |
| CA\_n3-n41 | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 3 |
| CA\_n3-n78 | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 3 |
| CA\_n5-n48 | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8 |
| CA\_n5-n66 | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 3 |
| CA\_n5-n77 | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 3 |
| CA\_n8-n78 | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 3 |
| CA\_n14-n30 | Frequency range | 769 | - | 775 | -35 | 0.00625 | 4 |
| Frequency range | 799 | - | 805 | -35 | 0.00625 | 4 |
| CA\_n14-n66 | Frequency range | 769 | - | 775 | -35 | 0.00625 | 4 |
| Frequency range | 799 | - | 805 | -35 | 0.00625 | 4 |
| CA\_n14-n77 | Frequency range | 769 | - | 775 | -35 | 0.00625 | 4,20 |
| Frequency range | 799 | - | 805 | -35 | 0.00625 | 4,20 |
| CA\_n26-n66 | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 3 |
| CA\_n26-n70 | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 3 |
| CA\_n28-n41 | Frequency range | 470 | - | 694 | -42 | 8 | 4, 14 |
|  | Frequency range | 470 | - | 710 | -26.2 | 6 | 13 |
|  | Frequency range | 662 | - | 694 | -26.2 | 6 | 4 |
|  | Frequency range | 758 | - | 773 | -32 | 1 | 4 |
|  | Frequency range | 773 | - | 803 | -50 | 1 |  |
|  | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 3, 11 |
| CA\_n28-n78 | Frequency range | 758 | - | 773 | -32 | 1 |  |
|  | Frequency range | 773 | - | 803 | -50 | 1 |  |
|  | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 3, 11 |
| CA\_n41-n79 | Same requirements as in Table 6.5A.3.2.0.3-2 | | | | | | |
| NOTE 1: Void  NOTE 2: Void  NOTE 3: Applicable when co-existence with PHS system operating in 1884.5 -1915.7MHz  NOTE 4: These requirements also apply for the frequency ranges that are less than FOOB (MHz) in Table 6.5.3.1-1 and Table 6.5A.3.1-1 from the edge of the channel bandwidth.  NOTE 5: Void.  NOTE 6: This requirement is applicable for any channel bandwidths within the range 1920 – 1980 MHz with the following restriction: for carriers of 15 MHz bandwidth when carrier centre frequency is within the range 1927.5 - 1929.5 MHz and for carriers of 20 MHz bandwidth when carrier centre frequency is within the range 1930 – 1938 MHz the requirement is applicable only for an uplink transmission bandwidth less than or equal to 54 RB.  NOTE 7: For these adjacent bands, the emission limit could imply risk of harmful interference to UE(s) operating in the protected operating band.  NOTE 8: This requirement is only applicable for carriers with bandwidth confined within 1885-1920 MHz (requirement for carriers with at least 1RB confined within 1880 - 1885 MHz is not specified). This requirement applies for an uplink transmission bandwidth less than or equal to 54 RB for carriers of 15 MHz bandwidth when carrier centre frequency is within the range 1892.5 - 1894.5 MHz and for carriers of 20 MHz bandwidth when carrier centre frequency is within the range 1895 - 1903 MHz.  NOTE 9: Void.  NOTE 10: Void.  NOTE 11:Applicable when the assigned NR carrier is confined within 718 MHz and 748 MHz and when the channel bandwidth used is 5 or 10 MHz.  NOTE 12: Void  NOTE 13: This requirement is applicable for 5 and 10 MHz NR channel bandwidth allocated within 718 - 728 MHz. For carriers of 10 MHz bandwidth, this requirement applies for an uplink transmission bandwidth less than or equal to 30 RB with RBstart > 1 and Rbstart < 48.  NOTE 14: This requirement is applicable in the case of a 10 MHz NR carrier confined within 703 MHz and 733 MHz, otherwise the requirement of -25 dBm with a measurement bandwidth of 8 MHz applies.  NOTE 15: As exceptions, measurements with a level up to the applicable requirement of -36 dBm/MHz is permitted for each assigned E-UTRA carrier used in the measurement due to 3rd harmonic spurious emissions. An exception is allowed if there is at least one individual RB within the transmission bandwidth (see Figure 5.6-1) for which the 3rd harmonic totally or partially overlaps the measurement bandwidth (MBW).  NOTE 16: Void  NOTE 17: Void  NOTE 18: Void  NOTE 19: Void  NOTE 20: Applicable for cases and when the lower edge of the assigned NR UL channel bandwidth frequency is greater than or equal to 1427 MHz + the channel BW assigned for 5 and 10 MHz bandwidth, and when the lower edge of the assigned NR UL channel bandwidth frequency is greater than or equal to 1440 MHz for 15 and 20 MHz bandwidth. | | | | | | | |

The normative reference for this requirement is TS 38.101-1 [2] subclause 6.5A.3.2.

##### 6.5A.3.2.1 Spurious emissions for UE co-existence for CA (2UL CA)

6.5A.3.2.1.1 Test purpose

To verify that UE transmitter does not cause unacceptable interference to co-existing systems for the specified bands which has specific requirements in terms of transmitter spurious emissions for 2UL CA.

6.5A.3.2.1.2 Test applicability

This test case applies to all types of NR UE release 15 and forward that support 2UL CA.

6.5A.3.2.1.3 Minimum conformance requirements

The minimum conformance requirements are defined in subclause 6.5A.3.2.0.

6.5A.3.2.1.4 Test description

6.5A.3.2.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, test channel bandwidths and sub-carrier spacing based on NR CA configuration specified in clause 5.5A. All of these configurations shall be tested with applicable test parameters for each CA configuration, are shown in Table 6.5A.3.2.1.4.1-1. The details of the uplink reference measurement channels (RMCs) are specified in Annexes A.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Table 6.5A.3.2.1.4.1-1: Inter band CA Test Configuration Table

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Initial Conditions | | | | | | | | | | | | | | | | | | | |
| Test Environment as specified in TS 38.508-1 [5] subclause 4.1 | | | | | | | | | | | | Normal | | | | | | | |
| Test Frequencies as specified in TS 38.508-1 [5] subclause4.3.1.1.3 for inter band CA in FR1 | | | | | | | | | | | | For test frequencies refer to “Range” columns. | | | | | | | |
| Test Channel Bandwidths as specified in TS 38.508-1 [5] subclause 4.3.1 | | | | | | | | | | | | Refer to “PCC NRB@SCS”and “SCC NRB@SCS” columns | | | | | | | |
| Test SCS as specified in Table 5.3.5-1 | | | | | | | | | | | | Lowest SCS for default test points.  CA configuration specific test points: Refer to “PCC NRB@SCS”and “SCC NRB@SCS” columns | | | | | | | |
| Test Parameters for CA Configurations | | | | | | | | | | | | | | | | | | | |
| ID | | CA Configuration / NRB\_agg | | | | | | | | | | DL Allocation | | | UL Allocation | | | | |
| CA Configuration | | | | | | | | PCC NRB @SCS | SCC NRB@SCS | CC MOD | PCC & SCC RB allocation | | CC MOD | | PCC & SCC RB allocations (LCRB @ RBstart) | | |
| PCC | | | | SCC | | | | PCC | SCC |
| Band | | Range | | Band | | Range | |
| 1 | | n1 | | Low | | n3 | | Low | | 25@15kHz | 25@15kHz | CP-OFDM QPSK | NA | | CP-OFDM QPSK | | 1@0 | 1@0 | |
| 2 | | n1 | | Mid | | n3 | | Low | | 25@15kHz | 25@15kHz | CP-OFDM QPSK | NA | | CP-OFDM QPSK | | 1@0 | 1@24 | |
| 1 | | n1 | | Low | | n8 | | Low | | 25@15kHz | 25@15kHz | CP-OFDM QPSK | NA | | CP-OFDM QPSK | | 1@0 | 1@0 | |
| Test Settings for CA\_n1A-n28A Configuration | | | | | | | | | | | | | | | | | | | |
| 1 | | n1 | | Low | | n28 | | Low | | 25@15kHz | 25@15kHz | CP-OFDM QPSK | NA | | CP-OFDM QPSK | | 1@0 | 1@0 | |
| 1 | | n1 | | LOW | | n79 | | MID | | 106@15kHz | 273@30kHz | CP-OFDM QPSK | NA | | CP-OFDM QPSK | | 1@0 | 1@181 | |
| 2 | | n1 | | LOW | | n79 | | 4618,41 MHz (NOTE 3) | | 79@15kHz | 216@15kHz | CP-OFDM QPSK | NA | | CP-OFDM QPSK | | 1@0 | 1@0 | |
| 3 | | n1 | | LOW | | n79 | | MID | | 106@15kHz | 273@30kHz | CP-OFDM QPSK | NA | | CP-OFDM QPSK | | 1@105 | 1@245 | |
| 4 | | n1 | | LOW | | n79 | | 4785,54 MHz (NOTE 4) | | 106@15kHz | 216@15kHz | CP-OFDM QPSK | NA | | CP-OFDM QPSK | | 1@0 | 1@0 | |
| 1 | | n2 | | Low | | n5 | | low | | 20/106 | 20/106 | CP-OFDM  QPSK | NA | | CP-OFDM  QPSK | | 1@0 | 1@0 | |
| 2 | | n2 | | High | | n5 | | High | | 20/106 | 20/106 | CP-OFDM  QPSK | NA | | CP-OFDM  QPSK | | 1@105 | 1@105 | |
| **Test Settings for CA\_n2A-n14A Configuration** | | | | | | | | | | | | | | | | | | | |
| 1 | n2 | | Mid | | n14 | | High | | 216@15kHz | | 52@15kHz | CP-OFDM  QPSK | NA | | | CP-OFDM  QPSK | 1@0 | | 1@51 |
| 2 | n2 | | Mid | | n14 | | Low | | 216@15kHz | | 52@15kHz | CP-OFDM  QPSK | NA | | | CP-OFDM  QPSK | 1@0 | | 1@0 |
| 1 | | n2 | | Low | | n77 | | Mid | | 106@15kHz | 273@30kHz | CP-OFDM QPSK | NA | | CP-OFDM QPSK | | 1@0 | 1@272 | |
| 2 | | n2 | | High | | n77 | | 3850,23 MHz (NOTE 5) | | 106@15kHz | 52@15kHz | CP-OFDM QPSK | NA | | CP-OFDM QPSK | | 1@0 | 1@0 | |
| 3 | | n2 | | High | | n77 | | 3965,25 MHz (NOTE 6) | | 106@15kHz | 52@15kHz | CP-OFDM QPSK | NA | | CP-OFDM QPSK | | 1@0 | 1@0 | |
| 4 | | n2 | | Low | | n77 | | 3500 MHz (NOTE 18) | | 106@15kHz | 273@30kHz | CP-OFDM QPSK | NA | | CP-OFDM QPSK | | 1@0 | 1@200 | |
| 1 | | n3 | | Low | | n8 | | Low | | 100@15kHz | 100@15kHz | CP-OFDM QPSK | NA | | CP-OFDM QPSK | | 1@99 | 1@0 | |
| 2 | | n3 | | High | | n8 | | High | | 100@15kHz | 100@15kHz | CP-OFDM QPSK | NA | | CP-OFDM QPSK | | 1@99 | 1@100 | |
| 3 | | n3 | | Low | | n8 | | High | | 100@15kHz | 100@15kHz | CP-OFDM QPSK | NA | | CP-OFDM QPSK | | 1@0 | 1@100 | |
| Test Settings for CA\_n3A-n77A Configuration | | | | | | | | | | | | | | | | | | | |
| 5 | | n3 | | LOW | | n77 | | 3660.15MHz | | 106@15kHz | 273@30kHz | CP-OFDM QPSK | NA | | CP-OFDM QPSK | | 1@0 | 1@0 | |
| Test Settings for CA\_n3A-n78A Configuration | | | | | | | | | | | | | | | | | | | |
| 1 | | n3 | | LOW | | n78 | | HIGH | | 160@15kHz | 273@30kHz | CP-OFDM QPSK | NA | | CP-OFDM QPSK | | 1@159 | 1@272 | |
| Test Settings for CA\_n5A-n48A Configuration | | | | | | | | | | | | | | | | | | | |
| 1 | | n5 | | Low | | n48 | | Low | | 106@15kHz | 106@30kHz | CP-OFDM QPSK | NA | | CP-OFDM QPSK | | 1@0 | 1@0 | |
| Test Settings for CA\_n5A-n77A Configuration | | | | | | | | | | | | | | | | | | | |
| 7 | | n5 | | LOW | | n77 | | 3538,29 MHz (NOTE 11) | | 106@15kHz | 52@15kHz | CP-OFDM QPSK | NA | | CP-OFDM QPSK | | 1@0 | 1@0 | |
| **Test Settings for CA\_n8A-n78A Configuration** | | | | | | | | | | | | | | | | | | | |
| 3 | | n8 | | HIGH | | n78 | | HIGH | | 106@15kHz | 273@30kHz | CP-OFDM QPSK | NA | | CP-OFDM QPSK | | 1@105 | 1@35 | |
| Test Settings for CA\_n28A-n78A Configuration | | | | | | | | | | | | | | | | | | | |
| 1 | | n28 | | Low | | n78 | | Low | | 106@15kHz | 273@30kHz | CP-OFDM  QPSK | NA | | CP-OFDM  QPSK | | 1@0 | [1@0](mailto:1@0) | |
| Test Settings for CA\_n28A-n41A Configuration | | | | | | | | | | | | | | | | | | | |
| 2 | | n28 | | HIGH | | n41 | | HIGH | | 79@15kHz | 217@30kHz | CP-OFDM QPSK | NA | | CP-OFDM QPSK | | 1@78 | 1@115 | |
| **Test Settings for CA\_n28A-n77A Configuration** | | | | | | | | | | | | | | | | | | | |
| 7 | | N28 | | Low | | N77 | | Low | | 106@15kHz | 273@30kHz | CP-OFDM QPSK | NA | | CP-OFDM QPSK | | 1@0 | 1@0 | |
| **Test Settings for CA\_n41A-n77A Configuration** | | | | | | | | | | | | | | | | | | | |
| 1 | | n41 | | MID | | n77 | | LOW | | 273@30kHz | 273@30kHz | CP-OFDM QPSK | NA | | CP-OFDM QPSK | | 1@272 | 1@272 | |
| Test Settings for CA\_n41A-n79A Configuration | | | | | | | | | | | | | | | | | | | |
| 4 | | n41 | | HIGH | | n79 | | LOW | | 273@30kHz | 273@30kHz | CP-OFDM QPSK | NA | | CP-OFDM QPSK | | 1@0 | 1@0 | |
| Test Settings for CA\_n66A-n78A Configuration | | | | | | | | | | | | | | | | | | | |
| 1 | n66 | | Mid | | n78 | | High | | 216@15kHz | | 273@30kHz | CP-OFDM QPSK | NA | | | CP-OFDM QPSK | [1@215](mailto:1@215) | | [1@0](mailto:1@0) |
| Test Settings for CA\_n70A-n71A Configuration | | | | | | | | | | | | | | | | | | | |
| 1 | | n70 | | Low | | n71 | | Low | | 79@15kHz | 106@15kHz | QPSK/CP-OFDM QPSK | NA | | QPSK / CP-OFDM QPSK | | 1@0 | 1@0 | |
| NOTE 1: No impact on the protected bands by 2nd and 3rd order IM products caused by the NR CA band combination.  NOTE 2: Test Point ID 2 for CA\_n1A-n78A and Band n78 is defined as a carrier with CBW=10MHz and centre frequency at 3421.14MHz (NR ARFCN=628067).  NOTE 3: Test Point ID 2 for CA\_n1A-n79A and Band n79 is defined as a carrier with CBW=40MHz and centre frequency at 4618.41MHz (NR ARFCN=707867).  NOTE 4: Test Point ID 4 for CA\_n1A-n79A and Band n79 is defined as a carrier with CBW=40MHz and centre frequency at 4785.54MHz (NR ARFCN=719000).  NOTE 5: Test Point ID 2 for CA\_n2A-n77A and Band n77 is defined as a carrier with CBW=10MHz and centre frequency at 3850.23MHz (NR ARFCN=656667).  NOTE 6: Test Point ID 3 for CA\_n2A-n77A and Band n77 is defined as a carrier with CBW=10MHz and centre frequency at 3965.25MHz (NR ARFCN=664333).  NOTE 7: Test point ID 5 and 6 for CA\_n3A-n41A test protected NR band 100 introduced in Rel-17.  NOTE 8: Test Point ID 3 for CA\_n5A-n77A and Band n77 is defined as a carrier with CBW=10MHz and centre frequency at 3458.79MHz (NR ARFCN=630533).  NOTE 9: Test Point ID 4 for CA\_n5A-n77A and Band n77 is defined as a carrier with CBW=10MHz and centre frequency at 3593.79MHz (NR ARFCN=639533).  NOTE 10: Test Point ID 5 for CA\_n5A-n77A and Band n77 is defined as a carrier with CBW=10MHz and centre frequency at 4021.89MHz (NR ARFCN=668067).  NOTE 11: Test Point ID 7 for CA\_n5A-n77A and Band n77 is defined as a carrier with CBW=10MHz and centre frequency at 3538.29MHz (NR ARFCN=635867).  NOTE 12: Test Point ID 1 for CA\_n66A-n77A and Band n77 is defined as a carrier with CBW=10MHz and centre frequency at 3825.24MHz (NR ARFCN=655000).  NOTE 13: Test Point ID 3 for CA\_n66A-n77A and Band n77 is defined as a carrier with CBW=10MHz and centre frequency at 4065.18MHz (NR ARFCN=671000).  NOTE 14: Test point ID 6 for CA\_n66A-n77A tests protected E-UTRA band 103 introduced in Rel-17.  NOTE 15: Test Point ID 2 for CA\_n28A-n77A and Band n77 is defined as a carrier with CBW=10MHz and centre frequency at 3421.14MHz (NR ARFCN=628076).  NOTE 16: Test Point ID 3 and 6 for CA\_n28A-n77A and Band n77 is defined as a carrier with CBW=10MHz and centre frequency at 3531.36MHz (NR ARFCN=635424).  NOTE 17: Test Point ID 5 for CA\_n28A-n77A test protected NR band 101 introduced in Rel-17.  NOTE 18: Test point ID 4 for CA\_n2A-n77A and Band n77 has the centre frequency of 3500 MHz in Band n77 (NR ARFCN=633333). | | | | | | | | | | | | | | | | | | | |

Table 6.5A.3.2.1.4.1-2: Intra-band contiguous CA Test Configuration Table

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Initial Conditions | | | | |
| Test Environment as specified in TS 38.508-1 [5] subclause 4.1 | | Normal | | |
| Test Frequencies as specified in TS 38.508-1 [5] subclause4.3.1.1.3 for inter band CA in FR1 | | Low range, High range | | |
| Test Channel Bandwidths as specified in TS 38.508-1 [5] subclause 4.3.1 | | Lowest NRB\_agg, Highest NRB\_agg | | |
| Test SCS as specified in Table 5.5A.3-1 | | Lowest | | |
| Test Parameters | | | | |
| Test ID | Downlink Configuration | Uplink Configuration | | |
| Modulation | RB allocation (NOTE 1) | |
| PCC | SCC |
| 1 | N/A | CP-OFDM QPSK | Edge\_1RB\_Left | Edge\_1RB\_Right |
| 2 | CP-OFDM QPSK | Outer\_Full | Outer\_Full |
| NOTE 1: The specific configuration of each RB allocation is defined in Table 6.1-1.  NOTE 2: Test Channel Bandwidths and Test SCS are checked separately for each NR CA band combination, which applicable channel bandwidths and SCS are specified in Table 5.5A.3-1. | | | | |

Table 6.5A.3.2.1.4.1-3: Intra-band non-contiguous CA Test Configuration Table

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Initial Conditions | | | | |
| Test Environment as specified in TS 38.508-1 [5] subclause 4.1 | | Normal | | |
| Test Frequencies as specified in TS 38.508-1 [5] subclause 4.3.1.1.3 for inter band CA in FR1 | | Low range and High range test frequencies as specified in tables for non-contiguous CA configuration with UL CA | | |
| Test Channel Bandwidths as specified in TS 38.508-1 [5] subclause 4.3.1 | | Lowest NRB for PCC and SCC  Highest NRB for PCC and SCC | | |
| Test SCS as specified in Table 5.5A.3-1 | | Lowest | | |
| Test Parameters | | | | |
| Test ID | Downlink Configuration | Uplink Configuration | | |
| Modulation | RB allocation (NOTE 1) | |
| PCC | SCC |
| 1 | N/A | CP-OFDM QPSK | Edge\_1RB\_Left | Edge\_1RB\_Right |
| 2 | CP-OFDM QPSK | Outer\_Full | Outer\_Full |
| NOTE 1: The specific configuration of each RB allocation is defined in Table 6.1-1.  NOTE 2: Test Channel Bandwidths and Test SCS are checked separately for each NR CA band combination, which applicable channel bandwidths and SCS are specified in Table 5.5A.3-1. | | | | |

1. Connect the SS to the UE antenna connectors as shown in TS 38.508-1 [5] Annex A, in Figure A.3.1.1.3 for TE diagram and section A.3.2 for UE diagram.

2. The parameter settings for the cell are set up according to TS 38.508-1 [6] subclause4.4.3.

3. Downlink signals for PCC are initially set up according to Annex C.0, C.1, C.2, and uplink signals according to Annex G.0, G.1, G.2, G.3.0.

4. The UL Reference Measurement channels are set according to Table 6.5A.3.2.1.4.1-1.

5. Propagation conditions are set according to Annex B.0.

6. Ensure the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On,* Test Mode *On* and Test Loop Function *On* according to TS 38.508-1 [5] clause 4.5. Message contents are defined in clause 6.5A.3.2.1.4.3.

6.5A.3.2.1.4.2 Test procedure

1. Configure SCC according to Annex C.0, C.1, and Annex C.2 for all downlink physical channels.

2. The SS shall configure SCC as per TS 38.508-1 [5] clause 5.5.1. Message contents are defined in clause 6.5A.3.2.1.4.3.

3. SS activates SCC by sending the activation MAC CE (Refer TS 38.321 [18], clauses 5.9, 6.1.3.10). Wait for at least 2 seconds (Refer TS 38.133[19], clause9.3).

4. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0\_1 for C\_RNTI to schedule the UL RMC according to Table 6.5A.3.2.1.4.1-1, Table 6.5A.3.2.1.4.1-2 or Table 6.5A.3.2.1.4.1-3 on both PCC and SCC. Since the UE has no payload data to send, the UE transmits uplink MAC padding bits on the UL RMC.

5. Send continuously uplink power control "up" commands in every uplink scheduling information to the UE until the UE transmits at PUMAX level.

6. Measure the power of the transmitted signal with a measurement filter of bandwidths according to Table 6.5A.3.2.1.5-1, 6.5A.3.2.1.5-3 or 6.5A.3.2.1.5-4. The centre frequency of the filter shall be stepped in contiguous steps according to Table 6.5A.3.2.1.5-1, 6.5A.3.2.1.5-3 or 6.5A.3.2.1.5-4. The measured power shall be verified for each step. The measurement period shall capture the active time slots. During measurement the spectrum analyser shall be set to 'Detector' = RMS. If the sweep count is higher than one, the trace mode shall be average. For power class 2 intra-band contiguous carrier aggregation, the spurious emission is measured as the sum from both UE transmit antenna connectors when UE indicates support for dualPA-Architecture IE.

6.5A.3.2.1.4.3 Message contents

Message contents are according to TS 38.508-1 [5] subclause 4.6 with following exception.

Table 6.5A.3.2.1.4.3-1: FrequencyInfoUL-SIB for inter-band contiguous CA

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [5] Table 4.6.3-62 FrequencyInfoUL-SIB | | | |
| Information Element | Value/remark | Comment | Condition |
| p-Max | 16 |  | Power class 3 and Inter-band CA |

Table 6.5A.3.2.1.4.3-2: FrequencyInfoUL-SIB for intra-band contiguous CA

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [5] Table 4.6.3-62 FrequencyInfoUL-SIB | | | |
| Information Element | Value/remark | Comment | Condition |
| p-Max | 10 |  | Power class 3 and Intra-band contiguous CA with Bandwidth class C  Test ID 1 |
|  | 5 |  | Power class 3 and Intra-band contiguous CA with Bandwidth class C  Test ID 2 |
|  | 8 |  | Power class 3 and Intra-band contiguous CA with Bandwidth class B  Test ID 1 |
|  | 3 |  | Power class 3 and Intra-band contiguous CA with Bandwidth class B  Test ID 2 |
|  | 11 |  | Power class 2 and Intra-band contiguous CA with Bandwidth class C  Test ID 1 |
|  | 5 |  | Power class 2 and Intra-band contiguous CA with Bandwidth class C  Test ID 2 |

Table 6.5A.3.2.1.4.3-2: FrequencyInfoUL-SIB for intra-band non-contiguous CA

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [5] Table 4.6.3-62 FrequencyInfoUL-SIB | | | |
| Information Element | Value/remark | Comment | Condition |
| p-Max | 6 |  | Power class 3 and Intra-band non-contiguous CA  Test ID 1 |
|  | 6 |  | Power class 3 and Intra-band non-contiguous CA  Test ID 2 |

6.5A.3.2.1.5 Test requirement

Test requirements for Spurious Emissions UE Co-existence for inter-band CA are release specific and can be found in Table 6.5A.3.2.1.5-1, 6.5A.3.2.1.5-3 and 6.5A.3.2.1.5-4. If the UE support a band combination from a later release, the requirements for this band combination are taken from the table of earliest release where requirements for this band combination are defined. The test requirement of configurations for CA operating band including Band n41 also apply for the corresponding CA operating bands with Band n90 replacing Band n41.

For intra-band contiguous CA, the measured average power of spurious emission, derived in step 6, shall not exceed the described value in Tables 6.5A.3.2.1.5-3.

For intra-band non-contiguous CA, the measured average power of spurious emission, derived in step 6, shall not exceed the described value in Tables 6.5A.3.2.1.5-4.

Table 6.5A.3.2.1.5-1: Requirements for uplink inter-band carrier aggregation according to UE NR release (two bands)

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| NR CA | Release | Spurious emission | | | | | | |
| Configuration |  | Protected Band | Frequency range (Mhz) | | | Maximum Level (dBm) | MBW (MHz) | NOTE |
| CA\_n1-n28 | Rel-16  Rel-17 Rel-18 | Frequency range | 470 | - | 694 | -42 | 8 | 4, 14 |
|  |  | Frequency range | 470 | - | 710 | -26.2 | 6 | 15 |
| CA\_n2-n14 | Rel-16  Rel-17 | Frequency range | 769 | - | 775 | -35 | 0.00625 | 4 |
| Frequency range | 799 | - | 805 | -35 | 0.00625 | 4 |
|  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |
| CA\_n3-n77 | Rel-15  Rel-16  Rel-17 | Frequency range | 1884.5 | - | 1915.7 | -41+TT | 0.3 | 3 |
| CA\_n3-n78 | Rel-15  Rel-16  Rel-17 Rel-18 | Frequency range | 1884.5 | - | 1915.7 | -41+TT | 0.3 | 3 |
| CA\_n5-n48 | Rel-17  Rel-18 | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8 |
| CA\_n5-n77 | Rel-16  Rel-17 | Frequency range | 1884.5 | - | 1915.7 | -41+TT | 0.3 | 3 |
|  | Rel-18 | Frequency range | 1884.5 | - | 1915.7 | -41+TT | 0.3 | 3 |
| CA\_n8-n78 | Rel-15  Rel-16  Rel-17 Rel-18 | Frequency range | 1884.5 | - | 1915.7 | -41+TT | 0.3 | 3 |
|  |  |  |  |  |  |  |  |  |
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|  |  |  |  |  |  |  |  |  |
| CA\_n28-n41 | Rel-16  Rel-17  Rel-18 | Frequency range | 1884.5 | - | 1915.7 | -41+TT | 0.3 | 3, 11 |
| CA\_n28-n77 | Rel-16 | Frequency range | 1884.5 | - | 1915.7 | -41+TT | 0.3 | 3, 11 |
|  | Rel-17 | Frequency range | 1884.5 | - | 1915.7 | -41+TT | 0.3 | 3, 11 |
| CA\_n28-n78 | Rel-16  Rel-17  Rel-18 | Frequency range | 1884.5 | - | 1915.7 | -41+TT | 0.3 | 3,11 |
| CA\_n41-n77 | Rel-17  Rel-18 | Frequency range | 1884.5 | - | 1915.7 | -41+TT | 0.3 | 3 |
| CA\_n41-n79 | Rel-16  Rel-17  Rel-18 | Frequency range | 1884.5 | - | 1915.7 | -41+TT | 0.3 | 3 |
| CA\_n78-n79 | Rel-15 | E-UTRA Band 1, 3, 5, 8, 11, 18, 19, 21, 28, 34, 40, 41, 65, 74 | FDL\_low | - | FDL\_high | -50+TT | 1 |  |
| Rel-15  Rel-16  Rel-17 Rel-18 | Frequency range | 1884.5 | - | 1915.7 | -41+TT | 0.3 | 3 |
| NOTE 1: Void  NOTE 2: Void  NOTE 3: Applicable when co-existence with PHS system operating in 1884.5 -1915.7MHz  NOTE 4: These requirements also apply for the frequency ranges that are less than FOOB (MHz) in Table 6.5.3.1-1 and Table 6.5A.3.1-1 from the edge of the channel bandwidth.  NOTE 5: Void  NOTE 6: Void  NOTE 7: Void  NOTE 8: This requirement is only applicable for carriers with bandwidth confined within 1885-1920 MHz (requirement for carriers with at least 1RB confined within 1880 - 1885 MHz is not specified). This requirement applies for an uplink transmission bandwidth less than or equal to 54 RB for carriers of 15 MHz bandwidth when carrier centre frequency is within the range 1892.5 - 1894.5 MHz and for carriers of 20 MHz bandwidth when carrier centre frequency is within the range 1895 - 1903 MHz.  NOTE 9: Void.  NOTE 10: Void.  NOTE 11:Applicable when the assigned NR carrier is confined within 718 MHz and 748 MHz and when the channel bandwidth used is 5 or 10 MHz.  NOTE 12: Void  NOTE 13: Void  NOTE 14: Void  NOTE 15: Void  NOTE 16: Void  NOTE 17: Void  NOTE 18: Void  NOTE 19: Void  NOTE 20: Applicable for cases and when the lower edge of the assigned NR UL channel bandwidth frequency is greater than or equal to 1427 MHz + the channel BW assigned for 5 and 10 MHz bandwidth, and when the lower edge of the assigned NR UL channel bandwidth frequency is greater than or equal to 1440 MHz for 15 and 20 MHz bandwidth. | | | | | | | | |

Table 6.5A.3.2.1.5-1a: Void

Table 6.5A.3.2.1.5-1b: Void

Table 6.5A.3.2.1.5-2: Test Tolerance for uplink inter-band carrier aggregation (two bands)

|  |  |  |
| --- | --- | --- |
|  | f ≤ 3.0GHz | 3.0GHz < f ≤ 6GHz |
| BW ≤ 40MHz | 0 | 0 |
| 40MHz < BW ≤ 100MHz | 0 | 0 |

Unless otherwise stated, the spurious emission limits apply for the frequency ranges that are more than ΔfOOB (MHz) in Table 6.5.3.2.3-1 from the edge of the channel bandwidth. The spurious emission limits in Table 6.5.3.2.3-1 apply for all transmitter band configurations (NRB) and channel bandwidths for all CC combinations.

Table 6.5A.3.2.1.5-3: Requirements for uplink intra-band contiguous carrier aggregation

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| NR CA combination | Release | Spurious emission | | | | | | |
| Protected Band | Frequency range (MHz) | | | Maximum Level (dBm) | MBW (MHz) | NOTE |
| CA\_n7 | Rel-16 | E-UTRA Band 1, 2, 3, 4, 5, 7, 8, 12, 13, 14, 17, 20, 22, 26, 27, 28, 29, 30, 31, 32, 33, 34, 40, 42, 43, 50, 51, 52, 65, 66, 67, 68, 72, 74, 75, 76, 85,  NR Band n77, n78 | FDL\_low | - | FDL\_high | -50 | 1 |  |
| Rel-17 | E-UTRA Band 1, 2, 3, 4, 5, 7, 8, 12, 13, 14, 17, 20, 22, 26, 27, 28, 29, 30, 31, 32, 33, 34, 40, 42, 43, 50, 51, 52, 65, 66, 67, 68, 72, 74, 75, 76, 85, 103  NR Band n77, n78, n100 | FDL\_low | - | FDL\_high | -50 | 1 |  |
| CA\_n40 | Rel-17 | E-UTRA Band 1, 3, 5, 7, 8, 11, 18, 19, 20, 21, 22, 26, 27, 28, 31, 32, 33, 34, 38, 39, 41, 42, 43, 44, 45, 50, 51, 52, 65, 67, 68, 69, 72, 74, 75, 76,  NR Band n77, n78, n100 | FDL\_low | - | FDL\_high | -50 | 1 | 7 |
|  | NR Band n79 | FDL\_low | - | FDL\_high | -50 | 1 | 2, 4 |
|  | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 5 |
| CA\_n41 | Rel-16 | E-UTRA Band 1, 2, 3, 4, 5, 8, 12, 13, 14, 17, 24, 25, 26, 27, 28, 29, 30, 34, 39, 42, 44, 45, 48, 50, 51, 52, 65, 66, 70, 71, 73, 74, 85,  NR Band n77, n78 | FDL\_low | - | FDL\_high | -50 | 1 |  |
|  | NR Band n79 | FDL\_low | - | FDL\_high | -50 | 1 | 2, 4 |
|  | E-UTRA Band 9, 11, 18, 19, 21 | FDL\_low | - | FDL\_high | -50 | 1 | 6 |
|  | E-UTRA Band 40 | FDL\_low | - | FDL\_high | -40 | 1 |  |
|  | Frequency range | 1884.5 |  | 1915.7 | -41 | 0.3 | 5, 6 |
| Rel-17 | E-UTRA Band 1, 2, 3, 4, 5, 8, 12, 13, 14, 17, 24, 25, 26, 27, 28, 29, 30, 34, 39, 42, 44, 45, 48, 50, 51, 52, 65, 66, 70, 71, 73, 74, 85, 103  NR Band n77, n78, n100 | FDL\_low | - | FDL\_high | -50 | 1 |  |
|  | NR Band n79 | FDL\_low | - | FDL\_high | -50 | 1 | 2, 4 |
|  | E-UTRA Band 9, 11, 18, 19, 21 | FDL\_low | - | FDL\_high | -50 | 1 | 6 |
|  | E-UTRA Band 40 | FDL\_low | - | FDL\_high | -40 | 1 |  |
|  | Frequency range | 1884.5 |  | 1915.7 | -41 | 0.3 | 5, 6 |
|  | Rel-18 | E-UTRA Band 1, 2, 3, 4, 5, 8, 12, 13, 14, 17, 24, 25, 26, 27, 28, 29, 30, 34, 39, 42, 44, 45, 48, 50, 51, 52, 54, 65, 66, 70, 71, 73, 74, 85, 103  NR Band n77, n78, n100 | FDL\_low | - | FDL\_high | -50 | 1 |  |
|  |  | NR Band n79 | FDL\_low | - | FDL\_high | -50 | 1 | 2, 4 |
|  |  | E-UTRA Band 9, 11, 18, 19, 21 | FDL\_low | - | FDL\_high | -50 | 1 | 6 |
|  |  | E-UTRA Band 40 | FDL\_low | - | FDL\_high | -40 | 1 |  |
|  |  | Frequency range | 1884.5 |  | 1915.7 | -41 | 0.3 | 5, 6 |
| CA\_n48 | Rel-16 | E-UTRA Band 2, 4, 5, 12, 13, 14, 17, 24, 25, 26, 29, 30, 41, 50, 51, 66, 70, 71, 74, 85 | FDL\_low | - | FDL\_high | -50 | 1 |  |
| Rel-17 | E-UTRA Band 2, 4, 5, 12, 13, 14, 17, 24, 25, 26, 29, 30, 41, 50, 51, 66, 70, 71, 74, 85, 103 | FDL\_low | - | FDL\_high | -50 | 1 |  |
|  | Rel-18 | E-UTRA Band 2, 4, 5, 12, 13, 14, 17, 24, 25, 26, 29, 30, 41, 50, 51, 54, 66, 70, 71, 74, 85, 103 | FDL\_low | - | FDL\_high | -50 | 1 |  |
| CA\_n77 | Rel-16 | E-UTRA Band 1, 3, 5, 7, 8, 11, 18, 19, 20, 21, 26, 28, 34, 39, 40, 41, 65 | FDL\_low | - | FDL\_high | -50 | 1 |  |
|  | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 5 |
| Rel-17 | E-UTRA Band 1, 3, 5, 7, 8, 11, 18, 19, 20, 21, 26, 28, 34, 39, 40, 41, 65, n100 | FDL\_low | - | FDL\_high | -50 | 1 |  |
|  | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 5 |
|  | Rel-18 | E-UTRA Band 1, 3, 5, 7, 8, 11, 18, 19, 20, 21, 26, 28, 34, 39, 40, 41, 54, 65, n100 | FDL\_low | - | FDL\_high | -50 | 1 |  |
|  |  | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 5 |
| CA\_n78 | Rel-16 | E-UTRA Band 1, 3, 5, 7, 8, 11, 18, 19, 20, 21, 26, 28, 34, 39, 40, 41, 65 | FDL\_low | - | FDL\_high | -50 | 1 |  |
|  | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 5 |
| Rel-17 | E-UTRA Band 1, 3, 5, 7, 8, 11, 18, 19, 20, 21, 26, 28, 34, 39, 40, 41, 65, n100 | FDL\_low | - | FDL\_high | -50 | 1 |  |
|  | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 5 |
| CA\_n79 | Rel-16  Rel-17 | E-UTRA Band 1, 3, 5, 8, 11, 18, 19, 21, 28, 34, 39, 40, 41, 42, 65 | FDL\_low | - | FDL\_high | -50 | 1 |  |
|  | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 5 |
| NOTE 1: Void.  NOTE 2: Void.  NOTE 3: Void.  NOTE 4: As exceptions, measurements with a level up to the applicable requirements defined in Table 6.5.3.1-2 are permitted for each assigned NR carrier used in the measurement due to 2nd, 3rd, 4th or 5th harmonic spurious emissions. Due to spreading of the harmonic emission the exception is also allowed for the first 1 MHz frequency range immediately outside the harmonic emission on both sides of the harmonic emission. This results in an overall exception interval centred at the harmonic emission of (2 MHz + N x LCRB x RBsize kHz), where N is 2, 3, 4, 5 for the 2nd, 3rd, 4th or 5th harmonic respectively. The exception is allowed if the measurement bandwidth (MBW) totally or partially overlaps the overall exception interval.  NOTE 5: Applicable when co-existence with PHS system operating in 1884.5 - 1915.7 MHz.  NOTE 6: This requirement applies when the NR carrier is confined within 2545 – 2575 MHz or 2595 – 2645 MHz and the channel bandwidth is 10 or 20 MHz  NOTE 7: As exceptions, for 90 and 100 MHz aggregated bandwidth, -40 dBm/MHz is applicable in the frequency range of 2496 – 2505 MHz. | | | | | | | | |

Table 6.5A.3.2.1.5-4: Requirements for uplink intra-band non-contiguous carrier aggregation

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| NR CA combination | Release | Spurious emission | | | | | | |
| Protected Band | Frequency range (MHz) | | | Maximum Level (dBm) | MBW (MHz) | NOTE |
| CA\_n77 | Rel-16 | E-UTRA Band 1, 3, 5, 7, 8, 11, 18, 19, 20, 21, 26, 28, 34, 39, 40, 41, 65 | FDL\_low | - | FDL\_high | -50 | 1 |  |
| Rel-17 | E-UTRA Band 1, 3, 5, 7, 8, 11, 18, 19, 20, 21, 26, 28, 34, 39, 40, 41, 65  NR Band n100 | FDL\_low | - | FDL\_high | -50 | 1 |  |
| CA\_n78 | Rel-17  Rel-18 | E-UTRA Band 1, 3, 5, 7, 8, 11, 18, 19, 20, 21, 26, 28, 34, 39, 40, 41, 65  NR Band n101 | FDL\_low | - | FDL\_high | -50 | 1 |  |
| NOTE 1: FFS.  NOTE 2: FFS. | | | | | | | | |

#### 6.5A.3.3 Additional spurious emissions for CA

##### 6.5A.3.3.0 Minimum conformance requirements

6.5A.3.3.0.1 Additional spurious emissions for intra-band contiguous CA

6.5A.3.3.0.1.1 Requirement for network signalling value "CA\_ NS\_04"

When "CA\_NS04" is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 6.5A.3.3.0.1.1-1. This requirement also applies for the frequency ranges that are less than FOOB (MHz) in Table 6.5A.3.1.0-1 from the edge of the aggregated channel bandwidth. For power class 2 intra-band contiguous carrier aggregation, the additional spurious emissions are measured as the sum from both UE transmit antenna connectors when UE indicates support for *dualPA-Architecture* IE.

Table 6.5A.3.3.0.1.1-1: Additional requirements for "CA\_ NS\_04"

|  |  |  |
| --- | --- | --- |
| Frequency range  (MHz) | BWChannel\_CA (MHz) / Spectrum emission limit (dBm) | Measurement bandwidth |
|  | 20 to 190 MHz |  |
| 2495 ≤ f < 2496 | -13 | Max(1 % of BWChannel\_CA, 1 MHz) |
| 2490.5 ≤ f < 2495 | -13 | 1 MHz |
| 0.009 < f < 2490.5 | -25 | 1 MHz |

The normative reference for this requirement is TS 38.101-1 [2] subclause 6.5A.3.3.1

##### 6.5A.3.3.1 Additional spurious emissions for CA (2UL CA)

Editor’s note: The following aspects are either missing or not yet determined:

- Tests for network signalling value other than NS\_04 are not complete.

6.5A.3.3.1.1 Test purpose

To verify that UE transmitter does not cause unacceptable interference to other channels or other systems in terms of transmitter spurious emissions under the deployment scenarios where additional requirements are specified.

6.5A.3.3.1.2 Test applicability

This test case applies to all types of NR UE release 15 and forward that supports 2UL CA.

6.5A.3.3.1.3 Minimum conformance requirements

The minimum conformance requirements are defined in subclause 6.5A.3.3.0.

6.5A.3.3.1.4 Test description

6.5A.3.3.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, test channel bandwidths and sub-carrier spacing based on NR CA configuration specified in clause 5.5A. All of these configurations shall be tested with applicable test parameters for each CA configuration, are shown in Table 6.5A.3.3.1.4.1-1. The details of the uplink reference measurement channels (RMCs) are specified in Annexes A.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Table 6.5A.3.3.1.4.1-1: Test Configuration Table (network signalling value "CA\_NS\_04")

Same test configuration as listed in Table 6.2A.3.1.4.1-7 shall be used with the following exceptions:

* Only Test IDs 3~13 are tested.

1. Connect the SS to the UE antenna connectors as shown in TS 38.508-1 [5] Annex A, in Figure A.3.1.1.3 for TE diagram and section A.3.2 for UE diagram.

2. The parameter settings for the cell are set up according to TS 38.508-1 [5] subclause 4.4.3.

3. Downlink signals for PCC are initially set up according to Annex C.0, C.1 and C.2, and uplink signals according to Annex G.0, G.1, G.2, G.3.0.

4. The UL Reference Measurement channels are set according to Table 6.5A.3.3.1.4.1-1.

5. Propagation conditions are set according to Annex B.0.

6. Ensure the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On,* Test Mode *On* and Test Loop Function *On* according to TS 38.508-1 [5] clause 4.5. Message contents are defined in clause 6.5A.3.3.1.4.3.

6.5A.3.3.1.4.2 Test procedure

1. Configure SCC according to Annex C.0, C.1, C.2 for all downlink physical channels.

2. The SS shall configure SCC as per TS 38.508-1 [5] clause 5.1.1. Message contents are defined in clause 6.5A.3.3.1.4.3.

3. SS activates SCC by sending the activation MAC CE (Refer TS 38.321 [18], clauses 5.9, 6.1.3.10). Wait for at least 2 seconds (Refer TS 38.133[19], clause9.3).

4. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0\_1 for C\_RNTI to schedule the UL RMC according to Table 6.5A.3.3.1.4.1-1 on both PCC and SCC. Since the UE has no payload data to send, the UE transmits uplink MAC padding bits on the UL RMC.

5. Send continuously uplink power control "up" commands in every uplink scheduling information to the UE until the UE transmits at PUMAX level. Allow at least 200ms for the UE to reach PUMAX level.

6. Measure the mean power over all component carriers in the CA configuration of the radio access mode, which shall meet the requirements described in clause 6.2A.3. The period of the measurement shall be at least the continuous duration of one active sub-frame (1ms) and in the uplink symbols. For TDD slots with transient periods are not under test. For power class 2 intra-band contiguous carrier aggregation, the additional spectrum emission mask is measured as the sum from both UE transmit antenna connectors when UE indicates support for *dualPA-Architecture* IE.

7. Measure the power of the transmitted signal with a measurement filter of bandwidths according to Table 6.5A.3.3.1.5.1-1. The centre frequency of the filter shall be stepped in contiguous steps according to Table 6.5A.3.3.1.5.1-1. The measured power shall be verified for each step. The measurement period shall capture the active time slots. During measurement the spectrum analyser shall be set to 'Detector' = RMS. If the sweep count is higher than one, the trace mode shall be average. For power class 2 intra-band contiguous carrier aggregation, the additional spectrum emission mask is measured as the sum from both UE transmit antenna connectors when UE indicates support for *dualPA-Architecture* IE.

6.5A.3.3.1.4.3 Message contents

Message contents are same as 6.2A.3.1.4.3.

6.5A.3.3.1.5 Test requirement

6.5A.3.3.1.5.1 Test requirements (network signalling value "CA\_NS\_04")

When "CA\_NS\_04" is indicated in the cell:

- the measured UE mean power in the channel bandwidth, derived in step 6, shall fulfil requirements in Table 6.2A.3.1.5-7 for UE power class 3 or Table 6.2A.3.1.5-8 UE power class 2.

and

- the power of any UE emission derived in step 7 shall fulfil requirements in table 6.5A.2.3.1.5.1-1. This requirement also applies for the frequency ranges that are less than FOOB (MHz) in Table 6.5A.3.1-1 from the edge of the aggregated channel bandwidth.

Table 6.5A.3.3.1.5.1-1: Additional requirements for "CA\_ NS\_04"

|  |  |  |
| --- | --- | --- |
| Frequency range  (MHz) | BWChannel\_CA (MHz) / Spectrum emission limit (dBm) | Measurement bandwidth |
|  | 20 to 190 MHz |  |
| 2495 ≤ f < 2496 | -13 | Max(1 % of BWChannel\_CA, 1 MHz) |
| 2490.5 ≤ f < 2495 | -13 | 1 MHz |
| 0.009 < f < 2490.5 | -25 | 1 MHz |

### 6.5A.4 Transmit intermodulation for CA

#### 6.5A.4.0 Minimum conformance requirements

For inter-band carrier aggregation with uplink assigned to two NR bands, the transmit intermodulation requirement is specified in Table 6.5.4-1 which shall apply on each component carrier with both component carriers active.

For intra-band contiguous carrier aggregation the requirement of transmitting intermodulation is specified in Table 6.5A.4.0-1.

Table 6.5A.4.0-1: Transmit Intermodulation

|  |  |  |  |
| --- | --- | --- | --- |
| CA bandwidth class(UL) | B and C | | |
| Interference Signal  Frequency Offset | BWChannel\_CA | 2\*BWChannel\_CA | |
| Interference CW Signal Level | -40dBc | | |
| Intermodulation Product | -29dBc | -35dBc | |
| Measurement bandwidth  (NOTE1) | Nominal channel space+MBWACLR,low/2+ MBWACLR,high/2 | | |
| Measurement offset from channel center | BWChannel\_CA and 2\*BWChannel\_CA | | 2\*BWChannel\_CA and 4\*BWChannel\_CA |
| NOTE 1: MBWACLR,low and MBWACLR,high are the single-channel ACLR measurement bandwidths specified for channel bandwidths BWchannel(low) and BWchannel(high) in 6.5.2.4.1, respectively. | | | |

The normative reference for this requirement is TS 38.101-1 [2] clause 6.5A.4.

#### 6.5A.4.1 Transmit intermodulation for CA (2UL CA)

6.5A.4.1.1 Test purpose

To verify that the UE transmit intermodulation does not exceed the described value in the test requirement.

The transmit intermodulation performance 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 wanted signal and an interfering signal reaching the transmitter via the antenna.

6.5A.4.1.2 Test applicability

This test case applies to all types of NR UE release 15 and forward that supports 2UL CA.

6.5A.4.1.3 Minimum conformance requirements

The minimum conformance requirements are defined in subclause 6.5A.4.0.

6.5A.4.1.4 Test description

6.5A.4.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, test channel bandwidths and sub-carrier spacing based on NR CA configuration specified in clause 5.5A. All of these configurations shall be tested with applicable test parameters for each CA configuration, are shown in Tables 6.5A.4.1.4.1-1 and 6.5A.4.1.4.1-2. The details of the uplink reference measurement channels (RMCs) are specified in Annexes A.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Table 6.5A.4.1.4.1-1: Inter-band CA Test Configuration Table

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Initial Conditions | | | | |
| Test Environment as specified in TS 38.508-1 [5] subclause 4.1 | | Normal | | |
| Test Frequencies as specified in TS 38.508-1 [5] subclause4.3.1.1.3 for inter band CA in FR1 | | Mid range for PCC and SCC (NOTE 4) | | |
| Test Channel Bandwidths as specified in TS 38.508-1 [5] subclause 4.3.1 | | Lowest NRB\_agg for both PCC and SCC  Highest NRB\_agg for both PCC and SCC | | |
| Test SCS as specified in Table 5.3.5-1 | | Smallest and biggest supported SCS per Channel Bandwidth | | |
| Test Parameters | | | | |
| Test ID | Downlink Configuration | Uplink Configuration | | |
| Modulation(NOTE 3) | RB allocation (NOTE 1) | |
| PCC | SCC |
| 13 | N/A | DFT-s-OFDM PI/2 BPSK | Inner Full | Inner Full |
| 2 | DFT-s-OFDM QPSK | Inner Full | Inner Full |
| NOTE 1: The specific configuration of each RB allocation is defined in Table 6.1-1.  NOTE 2: Test Channel Bandwidths and Test SCS are checked separately for each NR CA band combination, which applicable channel bandwidths is specified in Table 5.5A.3.1-1 and SCS is specified in Table 5.3.5-1 for each NR band.  NOTE 3: DFT-s-OFDM PI/2 BPSK test applies only for UEs which supports half Pi BPSK in FR1.  NOTE 4: For NR band n28, 30MHz test channel bandwidth is tested with Low range test frequencies. | | | | |

Table 6.5A.4.1.4.1-2: Intra-band CA Test Configuration Table

|  |  |  |  |
| --- | --- | --- | --- |
| Initial Conditions | | | |
| Test Environment as specified in TS 38.508-1 [5] subclause 4.1 | | Normal | |
| Test Frequencies as specified in TS 38.508-1 [5] subclause4.3.1.1.3 for inter band CA in FR1 | | Mid range for PCC and SCC (NOTE 4) | |
| Test Channel Bandwidths as specified in TS 38.508-1 [5] subclause 4.3.1 | | Lowest NRB\_agg for both PCC and SCC  Highest NRB\_agg for both PCC and SCC | |
| Test SCS as specified in Table 5.3.5-1 | | Lowest and highest supported SCS per Channel Bandwidth | |
| Test Parameters | | | |
| Test ID | Downlink Configuration | Uplink Configuration | |
| Modulation(NOTE 3) | RB allocation (NOTE 1) |
|  |
| 13 | N/A | DFT-s-OFDM PI/2 BPSK | Inner Full |
| 2 | DFT-s-OFDM QPSK | Inner Full |
| NOTE 1: The specific configuration of each RB allocation is defined in Table 6.1A-1a.  NOTE 2: Test Channel Bandwidths and Test SCS are checked separately for each NR CA band combination, which applicable channel bandwidths is specified in Table 5.5A.1-1 and SCS is specified in Table 5.3.5-1 for each NR band.  NOTE 3: DFT-s-OFDM PI/2 BPSK test applies only for UEs which supports half Pi BPSK in FR1. | | | |

1. Connect the SS to the UE antenna connectors as shown in TS 38.508-1 [5] Annex A, in Figure A.3.1.1.3 for TE diagram and section A.3.2 for UE diagram.

2. The parameter settings for the cell are set up according to TS 38.508-1 [5] subclause 4.4.3.

3. Downlink signals for PCC are initially set up according to Annex C.0, C.1, C.2, and uplink signals according to Annex G.0, G.1, G.2, G.3.0.

4. The UL Reference Measurement channels are set according to Tables 6.5A.4.1.4.1-1 and 6.5A.4.1.4.1-2.

5. Propagation conditions are set according to Annex B.0.

6. Ensure the UE is in State RRC\_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On,* Test Mode *On* and Test Loop Function *On* according to TS 38.508-1 [5] clause 4.5. Message contents are defined in clause 6.5A.4.1.4.3.

6.5A.4.1.4.2 Test procedure

1. Configure SCC according to Annex C.0, C.1, C.2 for all downlink physical channels.

2. The SS shall configure SCC as per TS 38.508-1 [5] clause 5.5.1. Message contents are defined in clause 6.5A.4.1.4.3.

3. SS activates SCC by sending the activation MAC CE (Refer TS 38.321 [18], clauses 5.9, 6.1.3.10). Wait for at least 2 seconds (Refer TS 38.133[19], clause9.3).

4. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0\_1 for C\_RNTI to schedule the UL RMC according to Table 6.5A.4.1.4.1-1 for inter-band CA or 6.5A.4.1.4.1-2 for intra-band CA on both PCC and SCC. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC.

5. Send continuously uplink power control "up" commands on PCC and SCC to the UE until the UE transmits at its PUMAX level; allow at least 200ms starting from the first TPC command in this step for the UE to reach PUMAX level

6. Measure the rectangular filtered mean power of the UE. For TDD slots with transient periods are not under test for the wanted signal and for the intermodulation product.

7. For inter-band CA: Set the interference signal frequency below the UL carrier frequency of the PCC using the first offset in Table 6.5A.4.1.5-1.

For intra-band CA: set interference signal frequency below the UL carrier frequency of the lowest carrier using the first offset in Table 6.5A.4.1.5-1a.

8. Set the interference CW signal level according to Table 6.5A.4.1.5-1 for inter-band CA and table 6.5A.4.1.5-1a for intra-band contiguous CA.

9. For inter-band CA: Search the intermodulation product signals below and above the UL carrier frequency of the PCC and not overlapping with the UL BW of the other CC, then measure the rectangular filtered mean power of transmitting intermodulation for both signals and calculate the ratios with the power measured in step 6.

For intra-band CA: Search the intermodulation product signals below and above the aggregated UL carriers, then measure the rectangular filtered mean power of transmitting intermodulation for both signals, and calculate the ratios with the power measured in step 6.

10. For inter-band CA: Set the interference signal frequency above the UL carrier frequency of the PCC using the first offset in Table 6.5A.4.1.5-1.

For intra-band CA: set interference signal frequency above the UL carrier frequency of the highest carrier using the first offset in Table 6.5A.4.1.5-1a.

11. For inter-band CA: Search the intermodulation product signals below and above the UL carrier frequency of the PCC and not overlapping with the UL BW of the other CC, then measure the rectangular filtered mean power of transmitting intermodulation for both signals, and calculate the ratios with the power measured in step 6.

For intra-band CA: Search the intermodulation product signals below and above the aggregated UL carriers, then measure the rectangular filtered mean power of transmitting intermodulation for both signals, and calculate the ratios with the power measured in step 6.

12. For inter-band CA: Set the interference signal frequency below the UL carrier frequency of the SCC using the first offset in Table 6.5A.4.1.5-1.

13. For inter-band CA: Search the intermodulation product signals below and above the UL carrier frequency of the SCC and not overlapping with the UL BW of the other CC, then measure the rectangular filtered mean power of transmitting intermodulation for both signals and calculate the ratios with the power measured in step 6.

14. For inter-band CA: Set the interference signal frequency above the UL carrier frequency of the SCC using the first offset in Table 6.5A.4.1.5-1.

15. For inter-band CA: Search the intermodulation product signals below and above the UL carrier frequency of the SCC and not overlapping with the UL BW of the other CC, then measure the rectangular filtered mean power of transmitting intermodulation for both signals and calculate the ratios with the power measured in step 6.

16. Repeat the measurement using the second offset in Table 6.5A.4.1.5-1 for inter-band CA and table 6.5A.4.1.5-1a for intra-band CA.

NOTE 1: When switching to DFT-s-OFDM waveform, as specified in the test configuration table 6.5.2.2.4.1-1, send an NR RRCReconfiguration message according to TS 38.508-1 [5] clause 4.6.3 Table 4.6.3-118 PUSCH-Config with TRANSFORM\_PRECODER\_ENABLED condition.

6.5A.4.1.4.3 Message contents

Message contents are according to TS 38.508-1 [5] subclause 4.6 with following exception:

Table 6.5A.4.1.4.3-1: FrequencyInfoUL-SIB for inter-band CA

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [5] Table 4.6.3-62 FrequencyInfoUL-SIB | | | |
| Information Element | Value/remark | Comment | Condition |
| p-Max | 20 |  | Power class 3 and Inter-band CA |

6.5A.4.1.5 Test requirement

Inter-band CA: The ratio derived in steps 9, 11, 13 and 15, shall not exceed the described value in Table 6.5A.4.1.5-1.

Intra-band CA: The ratio derived in steps 9, 11, shall not exceed the described value in Table 6.5A.4.1.5-1a.

Table 6.5A.4.1.5-1: Transmit Intermodulation for inter-band CA

|  |  |  |
| --- | --- | --- |
| Wanted signal  channel bandwidth | BWChannel | |
| Interference signal  frequency offset from channel centre | BWChannel | 2\*BWChannel |
| Interference CW signal level | -40dBc | |
| Intermodulation product | <-29dBc+TT | < -35dBc+TT |
| Measurement bandwidth | The maximum transmission bandwidth configuration among the different SCSs for the channel BW as defined in Table 6.5.2.4.1.5-1 | |
| Measurement offset from channel centre | BWChannel and 2\*BWChannel | 2\*BWChannel and 4\*BWChannel |

Table 6.5A.4.1.5-1a: Transmit Intermodulation for intra-band CA

|  |  |  |  |
| --- | --- | --- | --- |
| CA bandwidth class(UL) | B and C | | |
| Interference Signal  Frequency Offset | BWChannel\_CA | 2\*BWChannel\_CA | |
| Interference CW Signal Level | -40dBc | | |
| Intermodulation Product | -29dBc | -35dBc | |
| Measurement bandwidth  (NOTE1) | Nominal channel space+MBWACLR,low/2+ MBWACLR,high/2 | | |
| Measurement offset from channel center | BWChannel\_CA and 2\*BWChannel\_CA | | 2\*BWChannel\_CA and 4\*BWChannel\_CA |
| NOTE 1: MBWACLR,low and MBWACLR,high are the single-channel ACLR measurement bandwidths specified for channel bandwidths BWchannel(low) and BWchannel(high) in 6.5.2.4.1.5-1, respectively. | | | |

Table 6.5A.4.1.5-2: Test Tolerance for Transmit Intermodulation

|  |  |  |
| --- | --- | --- |
|  | f ≤ 3.0GHz | 3.0GHz < f ≤ 6GHz |
| BW ≤ 40MHz | 0dB | 0dB |
| 40MHz < BW ≤ 100MHz | 0dB | 0dB |

## 6.5B Output RF spectrum emissions for NR-DC

For inter-band NR-DC with one uplink carrier assigned per NR band, the output RF spectrum emissions for the corresponding inter-band CA configuration as specified in clause 6.5A applies.

Note: For NR-DC testing, replace CA by NR-DC, PCC by PCell, and SCC by PSCell in clause 6.5A.

### 6.5B.1 Occupied bandwidth for NR-DC

For inter-band dual connectivity, the occupied bandwidth for the corresponding inter-band CA configuration as specified in clause 6.5A.1 applies.

Note: For NR-DC testing, replace CA by NR-DC, PCC by PCell, and SCC by PSCell in clause 6.5A.1.

### 6.5B.2 Out of band emission for NR-DC

#### 6.5B.2.1 General

This clause contains requirements for out of band emissions for UE configured of dual connectivity.

#### 6.5B.2.2 Spectrum emission mask

For inter-band dual connectivity, the Spectrum emission mask for the corresponding inter-band CA configuration as specified in clause 6.5A.2.2 applies.

Note: For NR-DC testing, replace CA by NR-DC, PCC by PCell, and SCC by PSCell in clause 6.5A.2.2.

#### 6.5B.2.4 Adjacent channel leakage ratio

For inter-band dual connectivity, the Adjacent Channel Leakage power Ratio (ACLR) for the corresponding inter-band CA configuration as specified in clause 6.5A.2.4 applies.

Note: For NR-DC testing, replace CA by NR-DC, PCC by PCell, and SCC by PSCell in clause 6.5A.2.4.

### 6.5B.3 Spurious emission for NR-DC

For inter-band dual connectivity, the spurious emissions for the corresponding inter-band CA configuration as specified in clause 6.5A.3 applies.

Note: For NR-DC testing, replace CA by NR-DC, PCC by PCell, and SCC by PSCell in clause 6.5A.3.

### 6.5B.4 Transmit intermodulation for NR-DC

For inter-band dual connectivity, the transmit intermodulation for the corresponding inter-band CA configuration as specified in clause 6.5A.4 applies.

Note: For NR-DC testing, replace CA by NR-DC, PCC by PCell, and SCC by PSCell in clause 6.5A.4.

## 6.5C Output RF spectrum emissions for SUL

For a terminal that supports SUL for the band combination specified in Table 5.2C-1, the current version of the specification assumes the terminal is configured with active transmission either on UL carrier or SUL carrier at any time in one serving cell and the UE requirements for single carrier shall apply for the active UL or SUL carrier accordingly

### 6.5C.1 Occupied bandwidth for SUL

6.5C.1.1 Test purpose

To verify that the UE occupied bandwidth for all transmission bandwidth configurations supported by the UE supporting SUL are less than their specific limits when UE is configured using SUL transmission.

6.5C.1.2 Test applicability

This test applies to all types of NR UE release 15 and forward that support SUL operating on the SUL bands.

6.5C.1.3 Minimum conformance requirements

Same minimum conformance requirements as in clause 6.5.1.3

6.5C.1.4 Test description

Same test description as specified in clause 6.5.1.4 with following exceptions:

- Instead of Table 5.3.5-1 🡪 use Table 5.5C-1

- Instead of Table 6.5.1.4.1-1🡪 use Table 6.5C.1.4-1

Table 6.5C.1.4-1: Test Configuration Table

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Initial Conditions | | | | | |
| Test Environment as specified in TS 38.508-1 [5] subclause 4.1 | | | Normal | | |
| Test Frequencies as specified in TS 38.508-1 [5] subclause 4.3.1 | | | Mid range by default for SUL carrier  Mid Range for Non-SUL carrier | | |
| Test Channel Bandwidths as specified in TS 38.508-1 [5] subclause 4.3.1 | | | All for SUL carrier  Lowest for Non-SUL carrier | | |
| Test SCS as specified in Table 5.3.5-1 | | | 15kHz for SUL carrier and Lowest supported SCS for Non-SUL carrier | | |
| Test Parameters for Channel Bandwidths | | | | | |
|  | Downlink Configuration | UL Configuration | | SUL Configuration | |
| Test ID | N/A | N/A | | Modulation | RB allocation |
| 1 |  |  | | CP-OFDM QPSK | Outer\_full |
| Note 1: Test Channel Bandwidths are checked separately for each SUL band combination, the applicable channel bandwidths are specified in Table 5.5C-1.  Note 2: The specific configuration of each RB allocation is defined in Table 6.1-1.  Note 3: For NR band n83, 30MHz test channel bandwidth is tested with Low range test frequency. | | | | | |

- Connect the SS to the UE antenna connectors as shown in TS 38.508-1 [5] Annex A, Figure A.3.1.1.4 for TE diagram and section A.3.2 for UE diagram.

- The parameter setting for the cell are set up according to the TS 38.508-1 [5] subclause 4.4.3

- Downlink signals are initially setup according to Annex C.0, C.1, C.2 and uplink signals according to Annex G.0, G.1, G.2, and G.3.0 with consideration of supplementary uplink physical channels.

- Message contents in initial conditions are according to TS 38.508-1 [5] subclause 4.3.6.1.1.2 ensuring UL/SUL indicator in Table 4.3.6.1.1.2-1 with condition SUL, subclause 4.6 ensuring Tables 4.6.1-28 with condition SUL AND (RF OR RRM), 4.6.3-14 with condition SUL\_SUL for SUL carrier, with condition SUL, and Table 4.6.3-167 with condition PUSCH\_PUCCH\_ON\_SUL.

6.5C.1.5 Test requirement

The measured Occupied Bandwidth on SUL carrier shall not exceed values in Table 6.5C.1.5-1.

Table 6.5C.1.5-1: Occupied channel bandwidth

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | NR channel bandwidth | | | | | | | | |
|  | 5 MHz | 10 MHz | 15 MHz | 20 MHz | 25 MHz | 30 MHz | 40 MHz | 45 MHz | 50 MHz |
| Occupied channel bandwidth (MHz) | 5 | 10 | 15 | 20 | 25 | 30 | 40 | 45 | 50 |

### 6.5C.2 Out of band emission for SUL

#### 6.5C.2.1 General

Void

#### 6.5C.2.2 Spectrum emission mask for SUL

The spectrum emission mask of the UE applies to frequencies (ΔfOOB) starting from the ± edge of the assigned NR channel bandwidth. For frequencies greater than (ΔfOOB) the spurious requirements in subclause 6.5.3 are applicable.

NOTE: For measurement conditions at the edge of each frequency range, the lowest frequency of the measurement position in each frequency range should be set at the lowest boundary of the frequency range plus MBW/2. The highest frequency of the measurement position in each frequency range should be set at the highest boundary of the frequency range minus MBW/2. MBW denotes the measurement bandwidth defined for the protected band.

6.5C.2.2.1 Test purpose

To verify that the power of any UE emission shall not exceed specified level for the specified channel bandwidth.

6.5C.2.2.2 Test applicability

This test applies to all types of NR UE release 15 and forward that support SUL operating on the SUL bands.

6.5C.2.2.3 Minimum conformance requirements

Same minimum conformance requirements as in the clause 6.5.2.2.3.

6.5C.2.2.4 Test description

Same test description as PC 3 with contiguous allocation specified in clause 6.5.2.2 with following exceptions:

- Instead of Table 5.3.5-1 🡪 use Table 5.5C-1

- Instead of Table 6.5.2.2.4.1-1🡪 use Table 6.5C.2.2.4-1

Table 6.5C.2.2.4-1: Test Configuration Table

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Initial Conditions | | | | | | |
| Test Environment as specified in TS 38.508-1 [5] subclause 4.1 | | | | | Normal | |
| Test Frequencies as specified in TS 38.508-1 [5] subclause 4.3.1 | | | | | Low range, High range for SUL carrier  Mid range for Non-SUL carrier | |
| Test Channel Bandwidths as specified in TS 38.508-1 [5] subclause 4.3.1 | | | | | Lowest, Highest for SUL carrier  Lowest for Non-SUL carrier | |
| Test SCS as specified in Table 5.5C-1 | | | | | 15kHz for SUL carrier and Lowest supported SCS for Non-SUL carrier | |
| Test Parameters for Channel Bandwidths | | | | | | |
| Test ID | Freq | Downlink Configuration | UL Configuration | SUL Configuration | | |
|  |  | N/A | N/A | Modulation | | RB allocation |
| 1 | Low |  | DFT-s-OFDM PI/2 BPSK | | Edge\_1RB\_Left |
| 2 | High |  | DFT-s-OFDM PI/2 BPSK | | Edge\_1RB\_Right |
| 3 | Default |  |  | DFT-s-OFDM PI/2 BPSK | | Outer\_Full |
| 4 | Low |  |  | DFT-s-OFDM QPSK | | Edger\_1RB\_Left |
| 5 | High |  |  | DFT-s-OFDM QPSK | | Edge\_1RB\_Right |
| 6 | Default |  |  | DFT-s-OFDM QPSK | | Outer\_Full |
| 7 | Low |  |  | DFT-s-OFDM 16 QAM | | Edge\_1RB\_Left |
| 8 | High |  |  | DFT-s-OFDM 16 QAM | | Edge\_1RB\_Right |
| 9 | Default |  |  | DFT-s-OFDM 16 QAM | | Outer\_Full |
| 10 | Low |  |  | DFT-s-OFDM 64 QAM | | Edge\_1RB\_Left |
| 11 | High |  |  | DFT-s-OFDM 64 QAM | | Edge\_1RB\_Right |
| 12 | Default |  |  | DFT-s-OFDM 64 QAM | | Outer\_Full |
| 13 | Low |  |  | DFT-s-OFDM 256 QAM | | Edge\_1RB\_Left |
| 14 | High |  |  | DFT-s-OFDM 256 QAM | | Edge\_1RB\_Right |
| 15 | Default |  |  | DFT-s-OFDM 256 QAM | | Outer\_Full |
| 16 | Low |  |  | CP-OFDM QPSK | | Edge\_1RB\_Left |
| 17 | High |  |  | CP-OFDM QPSK | | Edge\_1RB\_Right |
| 18 | Default |  |  | CP-OFDM QPSK | | Outer\_Full |
| 19 | Low |  |  | CP-OFDM 16 QAM | | Edge\_1RB\_Left |
| 20 | High |  |  | CP-OFDM 16 QAM | | Edge\_1RB\_Right |
| 21 | Default |  |  | CP-OFDM 16 QAM | | Outer\_Full |
| 22 | Low |  |  | CP-OFDM 64 QAM | | Edge\_1RB\_Left |
| 23 | High |  |  | CP-OFDM 64 QAM | | Edge\_1RB\_Right |
| 24 | Default |  |  | CP-OFDM 64 QAM | | Outer\_Full |
| 25 | Low |  |  | CP-OFDM 256 QAM | | Edge\_1RB\_Left |
| 26 | High |  |  | CP-OFDM 256 QAM | | Edge\_1RB\_Right |
| 27 | Default |  |  | CP-OFDM 256 QAM | | Outer\_Full |
| 284 | Low |  |  | DFT-s-OFDM Pi/2 BPSK w Pi/2 BPSK DMRS | | Edge\_1RB\_Left |
| 294 | High |  |  | DFT-s-OFDM Pi/2 BPSK w Pi/2 BPSK DMRS | | Edge\_1RB\_Right |
| 304 | Default |  |  | DFT-s-OFDM Pi/2 BPSK w Pi/2 BPSK DMRS | | Outer Full |
| Note 1: Test Channel Bandwidths are checked separately for each SUL band combination, the applicable channel bandwidths are specified in Table 5.5C-1.  Note 2: The specific configuration of each RF allocation is defined in Table 6.1-1.  Note 3: DFT-s-OFDM PI/2 BPSK test applies only for UEs which supports half Pi BPSK in FR1.  Note 4: Applicable to UEs indicating support for UE capability *lowPAPR-DMRS-PUSCHwithPrecoding-r16*. | | | | | | |

- Connect the SS to the UE antenna connectors as shown in TS 38.508-1 [5] Annex A, Figure A.3.1.1.4 for TE diagram and section A.3.2 for UE diagram.

- The parameter setting for the cell are set up according to the TS 38.508-1 [5] subclause 4.4.3

- Downlink signals are initially setup according to Annex C.0, C.1, C.2 and uplink signals according to Annex G.0, G.1, G.2, and G.3.0 with consideration of supplementary uplink physical channels.

- Message contents in initial conditions are according to TS 38.508-1 [5] subclause 4.3.6.1.1.2 ensuring UL/SUL indicator in Table 4.3.6.1.1.2-1 with condition SUL, subclause 4.6 ensuring Table 4.6.1-28 with condition SUL AND (RF OR RRM), Tables 4.6.3-14 with condition SUL\_NUL for SUL carrier, and Table 4.6.3-167 with condition PUSCH\_PUCCH\_ON\_SUL. Message contents in Table 6.5.2.2.4.3-2 in clause 6.5.2.2 only apply to Test ID 28-30 in Table 6.5C.2.2.4.1-1.

6.5C.2.2.5 Test requirement

The measured sum of the UE mean power in the channel bandwidth on the SUL carrier, derived in step 3, shall fulfil requirements in Tables 6.2C.4.5-1 as appropriate, and the power of any UE emission shall fulfil requirements in Table 6.5C.2.2.5-1.

Table 6.5C.2.2.5-1: NR General spectrum emission mask

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Spectrum emission limit (dBm) / Channel bandwidth | | | | | | | | | | | | | | |
| ΔfOOB  (MHz) | 5  MHz | 10  MHz | 15  MHz | 20  MHz | 25  MHz | 30 MHz | 40  MHz | 50  MHz | 60  MHz | 70  MHz | 80  MHz | 90  MHz | 100  MHz | Measurement bandwidth |
| ± 0-1 | -13+TT | -13+TT | -13+TT | -13+TT | -13+TT | -13+TT | -13+TT |  |  |  |  |  |  | 1 % channel bandwidth |
| ± 0-1 |  |  |  |  |  |  |  | -24+TT | -24+TT | -24+TT | -24+TT | -24+TT | -24+TT | 30 kHz |
| ± 1-5 | -10+TT | -10+TT | -10+TT | -10+TT | -10+TT | -10+TT | -10+TT | -10+TT | -10+TT | -10+TT | -10+TT | -10+TT | -10+TT | 1 MHz |
| ± 5-6 | -13+TT | -13+TT | -13+TT | -13+TT | -13+TT | -13+TT | -13+TT | -13+TT | -13+TT | -13+TT | -13+TT | -13+TT | -13+TT |
| ± 6-10 | -25+TT |
| ± 10-15 |  | -25+TT |
| ± 15-20 |  |  | -25+TT |
| ± 20-25 |  |  |  | -25+TT |
| ± 25-30 |  |  |  |  | -25+TT |
| ± 30-35 |  |  |  |  |  | -25+TT |
| ± 35-40 |  |  |  |  |  |  |
| ± 40-45 |  |  |  |  |  |  | -25+TT |
| ± 45-50 |  |  |  |  |  |  |  |
| ± 50-55 |  |  |  |  |  |  |  | -25+TT |
| ± 55-60 |  |  |  |  |  |  |  |  |
| ± 60-65 |  |  |  |  |  |  |  |  | -25+TT |
| ± 65-70 |  |  |  |  |  |  |  |  |  |
| ± 70-75 |  |  |  |  |  |  |  |  |  | -25+TT |
| ± 75-80 |  |  |  |  |  |  |  |  |  |  |
| ± 80-85 |  |  |  |  |  |  |  |  |  |  | -25+TT |
| ± 85-90 |  |  |  |  |  |  |  |  |  |  |  |
| ± 90-95 |  |  |  |  |  |  |  |  |  |  |  | -25+TT |
| ± 95-100 |  |  |  |  |  |  |  |  |  |  |  |  |
| ± 100-105 |  |  |  |  |  |  |  |  |  |  |  |  | -25+TT |
| Note 1: The first and last measurement position with a 30 kHz filter is at ΔfOOB equals to 0.015 MHz and 0.985 MHz.  Note 2: At the boundary of spectrum emission limit, the first and last measurement position with a 1 MHz filter is the inside of +0.5MHz and -0.5MHz, respectively.  Note 3: The measurements are to be performed above the upper edge of the channel and below the lower edge of the channel.  Note 4: TT = 1.5 dB for f ≤ 3GHz, TT = 1.8 dB for 3GHz < f ≤ 4.2GHz, TT = 1.8 dB for 4.2GHz < f ≤ 6.0GHz. | | | | | | | | | | | | | | |

NOTE: As a general rule, the resolution bandwidth of the measuring equipment should be equal to the measurement bandwidth. However, to improve measurement accuracy, sensitivity and efficiency, the resolution bandwidth may be smaller than the measurement bandwidth. When the resolution bandwidth is smaller than the measurement bandwidth, the result should be integrated over the measurement bandwidth in order to obtain the equivalent noise bandwidth of the measurement bandwidth.

#### 6.5C.2.3 Additional spectrum emission mask for SUL

6.5C.2.3.1 Test purpose

Same test purpose as in clause 6.5.2.3.1

6.5C.2.3.2 Test applicability

This test applies to all types of NR UE release 15 and forward that support SUL operating on the SUL bands.

6.5C.2.3.3 Minimum conformance requirements

Same minimum conformance requirements as in the clause 6.5.2.3.3 with consideration of the NS\_03 and NS\_03U applicable to the SUL bands.

6.5C.2.3.4 Test description

Same test description as specified in clause 6.5.2.3.4 with following exceptions:

- Instead of Table 5.3.5-1 🡪 use Table 5.5C-1

- Connect the SS to the UE antenna connectors as shown in TS 38.508-1 [5] Annex A, Figure A.3.1.1.4 for TE diagram and section A.3.2 for UE diagram.

- The parameter setting for the cell are set up according to the TS 38.508-1 [5] subclause [4.4.3]

- Downlink signals are initially setup according to Annex C.0, C.1, C.2 and uplink signals according to Annex G.0, G.1, G.2, and G.3.0 with consideration of supplementary uplink physical channels.

- Message contents in initial conditions are according to TS 38.508-1 [5] subclause 4.3.6.1.1.2 ensuring UL/SUL indicator in Table 4.3.6.1.1.2-1 with condition SUL, subclause 4.6 ensuring Tables 4.6.1-28 with condition SUL AND (RF OR RRM), 4.6.3-14 with condition SUL\_SUL for SUL carrier,and Table 4.6.3-167 with condition PUSCH\_PUCCH\_ON\_SUL. All the AdditionalSpectrumEmission in 6.2.3.4.3 are sent in *SIB1* as part of *supplementaryUplink* instead of *uplinkConfigCommon*.

6.5C.2.3.5 Test requirement

6.5C.2.3.5.1 Test requirements (network signalling value "NS\_03" and "NS\_03U")

When "NS\_03" or "NS\_03U" is indicated in the cell:

- the measured UE mean power in the channel bandwidth, derived in step 3, shall fulfil requirements in Table 6.2C.5.5-1 for a NR UE.

and

- the power of any UE emission shall fulfil requirements in Table 6.5C.2.3.5.1-1, as applicable.

Table 6.5C.2.3.5.1-1: Additional requirements for "NS\_03" and "NS\_03U"

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Spectrum emission limit (dBm)/ Channel bandwidth | | | | | | |
| ΔfOOB  (MHz) | 5 MHz | 10 MHz | 15 MHz | 20 MHz | 40 MHz | Measurement bandwidth |
| ± 0-1 | -13 + TT | -13 + TT | -13 + TT | -13 + TT | -13 + TT | 1 % of channel BW |
| ± 1-6 | -13 + TT | -13 + TT | -13 + TT | -13 + TT | -13 + TT | 1 MHz |
| ± 6-10 | -25+ TT | -13+ TT | -13 + TT | -13 + TT | -13 + TT | 1 MHz |
| ± 10-15 |  | -25+ TT | -13 + TT | -13 + TT | -13 + TT | 1 MHz |
| ± 15-20 |  |  | -25+ TT | -13 + TT | -13 + TT | 1 MHz |
| ± 20-25 |  |  |  | -25+ TT | -13+ TT | 1 MHz |
| ± 25-40 |  |  |  |  | -13+ TT | 1 MHz |
| ± 40-45 |  |  |  |  | -25+ TT | 1 MHz |
| NOTE 1: TT for each frequency and channel bandwidth is specified in Table 6.5.2.3.5-1. | | | | | | |

NOTE: As a general rule, the resolution bandwidth of the measuring equipment should be equal to the measurement bandwidth. However, to improve measurement accuracy, sensitivity and efficiency, the resolution bandwidth may be smaller than the measurement bandwidth. When the resolution bandwidth is smaller than the measurement bandwidth, the result should be integrated over the measurement bandwidth in order to obtain the equivalent noise bandwidth of the measurement bandwidth.

#### 6.5C.2.4 Adjacent channel leakage ratio for SUL

Adjacent channel leakage power Ratio (ACLR) is the ratio of the filtered mean power centred on the assigned channel frequency to the filtered mean power centred on an adjacent channel frequency.

##### 6.5C.2.4.1 NR ACLR for SUL

6.5C.2.4.1.1 Test purpose

To verify that UE transmitter does not cause unacceptable interference to adjacent channels in terms of Adjacent Channel Leakage power Ratio (ACLR).

6.5C.2.4.1.2 Test applicability

This test applies to all types of NR UE release 15 and forward that support SUL operating on the SUL bands.

6.5C.2.4.1.3 Minimum conformance requirements

The minimum conformance requirements specified in Clause 6.5.2.4.1.3 applies to the UE that support SUL operating on the SUL bands.

The normative reference for this requirement is TS 38.101-1 clauses 6.5.2.4.1.

6.5C.2.4.1.4 Test description

Same test description as PC 3 with contiguous allocation specified in clause 6.5.2.4.1.4 with following exceptions:

- Instead of Table 5.3.5-1 🡪 use Table 5.5C-1

- Instead of the test configuration tables in clause 6.2.2.4.1🡪 use the test configuration tables in clause 6.2C.4.4

- Instead of the requirements described in clause 6.2.2.5🡪 use the requirements described in clause 6.2C.4.5

Table 6.5C.2.4.1.4-1: Void

- Connect the SS to the UE antenna connectors as shown in TS 38.508-1 [5] Annex A, Figure A.3.1.1.4 for TE diagram and section A.3.2 for UE diagram.

- The parameter setting for the cell are set up according to the TS 38.508-1 [5] subclause 4.4.3

- Downlink signals are initially setup according to Annex C.0, C.1, C.2 and uplink signals according to Annex G.0, G.1, G.2, and G.3.0 with consideration of supplementary uplink physical channels.

- Message contents in initial conditions are according to TS 38.508-1 [5] subclause 4.3.6.1.1.2 ensuring UL/SUL indicator in Table 4.3.6.1.1.2-1 with condition SUL, subclause 4.6 ensuring Table 4.6.1-28 with condition SUL AND (RF OR RRM),Tables 4.6.3-14 with condition SUL\_SUL for SUL carrier, and Table 4.6.3-167 with condition PUSCH\_PUCCH\_ON\_SUL. Message contents in Table 6.5.2.4.1.4.3-3 in clause 6.5.2.4.1.4 only apply to Test ID 33-35 in Table 6.2C.4.4-1.

6.5C.2.4.1.5 Test requirement

The measured UE mean power in the channel bandwidth on SUL carrier, derived in step 3, shall fulfil requirements in Clause 6.2C.4.5 as appropriate, and if the measured adjacent channel power is greater than –50 dBm then the measured NR ACLR, derived in step 6, shall be higher than the limits in Table 6.5C.2.4.1.5-1.

Table 6.5C.2.4.1.5-1: NR ACLR measurement bandwidth

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| NR channel bandwidth / NR ACLR measurement bandwidth | | | | | | | | | | | | |
|  | 5 MHz | 10 MHz | 15 MHz | 20 MHz | 25 MHz | 30 MHz | 40 MHz | 50 MHz | 60 MHz | 80 MHz | 90 MHz | 100 MHz |
| NR ACLR measurement bandwidth | 4.515 | 9.375 | 14.235 | 19.095 | 23.955 | 28.815 | 38.895 | 48.615 | 58.35 | 78.15 | 88.23 | 98.31 |

Table 6.5C.2.4.1.5-2: NR ACLR requirement

|  |  |  |  |
| --- | --- | --- | --- |
|  | Power class 1 | Power class 2 | Power class 3 |
| NR ACLR |  |  | 30 + TT dB |
| NOTE 1: TT = 0.8 dB for f ≤ 4.0GHz, TT = 1.0 dB for 4.0GHz < f ≤ 6.0GHz, | | | |

##### 6.5C.2.4.2 UTRA ACLR for SUL

6.5C.2.4.2.1 Test purpose

To verify that UE transmitter does not cause unacceptable interference to adjacent channels in terms of Adjacent Channel Leakage power Ratio (ACLR).

6.5C.2.4.2.2 Test applicability

This test applies for network signalling values NS\_03U, NS\_05U, NS\_43U, and NS\_100 to all types of NR UE release 15 and forward that support SUL operating on the SUL bands.

6.5C.2.4.2.3 Minimum conformance requirements

The minimum conformance requirements specified in Clause 6.5.2.4.2.3 applies to the UE that support SUL operating on the SUL bands.

The normative reference for this requirement is TS 38.101-clause 6.5.2.4.2.

6.5C.2.4.2.4 Test description

Same test description as specified in clause 6.5.2.4.2.4 with following exceptions:

Initial conditions are same as in subclause 6.2C.5.4 with the following exceptions:

- Only network signalling values NS\_03U, NS\_05U, NS\_43U, and NS\_100 with the corresponding SUL band defined in Table 6.2.3.3.1-1 need to perform UTRA ACLR test.

- Message contents in initial conditions are according to TS 38.508-1 [5] subclause 4.6 ensuring Tables 4.6.1-28 with condition SUL AND (RF OR RRM), Tables 4.6.3-14 with condition SUL\_SUL for SUL carrier, and Table 4.6.3-167 with condition PUSCH\_PUCCH\_ON\_SUL, together with the exceptions as specified in Table 6.5C.2.4.2.4-1

Table 6.5C.2.4.2.4-1: AdditionalSpectrumEmission

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [5] clause 4.6.3, Table 4.6.3-1 *AdditionalSpectrumEmission* | | | |
| Information Element | Value/remark | Comment | Condition |
| AdditionalSpectrumEmission | 3 (NS\_03U)  3 (NS\_05U)  1 (NS\_100)  3 (NS\_43U) | For SUL band n86  For SUL band n84  For SUL band n84 and n86  For SUL band n81 |  |

6.5C.2.4.2.5 Test requirement

UTRA ACLR requirement is applicable when signalled by the network with network signalling value indicated by the field *additionalSpectrumEmission*.

The measured UE mean total power in the channel bandwidth on SUL carrier, derived in step 3, shall fulfil requirements in Clause 6.2C.5.5 as appropriate, and if the measured adjacent channel power is greater than –50 dBm then the measured UTRA ACLR, derived in step 6, shall be higher than the limits in Table 6.5C.2.4.2.5-1.

Table 6.5C.2.4.2.5-1: NR ACLR requirement

|  |  |
| --- | --- |
|  | Power class 3 |
| UTRAACLR1 | 33 dB - TT |
| UTRAACLR2 | 36 dB - TT |
| NOTE 1: TT = 0.8 dB | |

### 6.5C.3 Spurious emissions for SUL

#### 6.5C.3.1 General spurious emissions for SUL

6.5C.3.1.1 Test purpose

To verify that UE transmitter does not cause unacceptable interference to other channels or other systems in terms of transmitter spurious emissions.

6.5C.3.1.2 Test applicability

This test applies to all types of NR UE release 15 and forward that support SUL operating on the SUL bands.

6.5C.3.1.3 Minimum conformance requirements

The general spurious emission requirement specified in clause 6.5.3.1.3 applies to the UE that support SUL operating on the SUL bands.

The normative reference for this requirement is TS 38.101-1 [2] subclauses 6.5.3.1

6.5C.3.1.4 Test description

Same test description as specified in clause 6.5.3.1.4 with following exceptions:

- Instead of Table 5.3.5-1 🡪 use Table 5.5C-1

- Instead of Table 6.5.3.1.4.1-1🡪 use Table 6.5C.3.1.4-1

Table 6.5C.3.1.4-1: Test Configuration Table

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Initial Conditions | | | | | |
| Test Environment as specified in TS 38.508-1 [5] subclause 4.1 | | | Normal | | |
| Test Frequencies as specified in TS 38.508-1 [5] subclause 4.3.1 | | | Low range, Mid range, High range for SUL carrier  Mid range for Non-SUL carrier | | |
| Test Channel Bandwidths as specified in TS 38.508-1 [5] subclause 4.3.1 | | | Lowest, Mid, Highest for SUL carrier  Lowest for Non-SUL carrier | | |
| Test SCS as specified in Table 5.3.5-1 | | | 15kHz for SUL carrier and Lowest supported SCS for Non-SUL carrier | | |
| Test Parameters for Channel Bandwidths | | | | | |
| Test ID | Downlink Configuration | UL Configuration | | SUL Configuration | |
|  | N/A | N/A | | Modulation | RB allocation (NOTE 2) |
| 1 |  |  | | CP-OFDM QPSK | OuterFull |
| 2 |  |  | | CP-OFDM QPSK | Edge\_1RB\_Left |
| 3 |  |  | | CP-OFDM QPSK | Edge\_1RB\_Right |
| NOTE 1: Test Channel Bandwidths are checked separately for each SUL band combination, the applicable channel bandwidths are specified in Table 5.5C-1.  NOTE 2: The specific configuration of each RB allocation is defined in Table 6.1-1.  NOTE 3: Void  NOTE 4: For NR band n83, 30MHz test channel bandwidth is tested with Low range and High range test frequencies. | | | | | |

- Connect the SS to the UE antenna connectors as shown in TS 38.508-1 [5] Annex A, Figure A.3.1.1.4 for TE diagram and section A.3.2 for UE diagram.

- The parameter setting for the cell are set up according to the TS 38.508-1 [5] subclause 4.4.3

- Downlink signals are initially setup according to Annex C.0, C.1, C.2 and uplink signals according to Annex G.0, G.1, G.2, and G.3.0 with consideration of supplementary uplink physical channels.

- Message contents in initial conditions are according to TS 38.508-1 [5] subclause 4.3.6.1.1.2 ensuring UL/SUL indicator in Table 4.3.6.1.1.2-1 with condition SUL, subclause 4.6 ensuring Tables 4.6.1-28 with condition SUL AND (RF OR RRM), 4.6.3-14 with condition SUL\_SUL for SUL carrier, and Table 4.6.3-167 with condition PUSCH\_PUCCH\_ON\_SUL.

6.5C.3.1.5 Test requirement

The measured average power of spurious emission on the SUL carrier, derived in step 3, shall not exceed the described value in Table 6.5C.3.1.5-1.

The spurious emission limits apply for the frequency ranges that are more than ΔfOOB (MHz) in Table 6.5.3.1.3-1from the edge of the channel bandwidth.

Table 6.5C.3.1.5-1: General spurious emissions test requirements

|  |  |  |  |
| --- | --- | --- | --- |
| Frequency Range | Maximum Level | Measurement bandwidth | NOTE |
| 9 kHz ≤ f < 150 kHz | -36 dBm | 1 kHz |  |
| 150 kHz ≤ f < 30 MHz | -36 dBm | 10 kHz |  |
| 30 MHz ≤ f < 1000 MHz | -36 dBm | 100 kHz |  |
| 1 GHz ≤ f < 12.75 GHz | -30 dBm | 1 MHz |  |
| 12.75 GHz ≤ f < 5th harmonic of the upper frequency edge of the UL operating band in GHz | -30 dBm | 1 MHz | 1 |
| 12.75 GHz < f < 26 GHz | -30 dBm | 1 MHz | 2 |
| NOTE 1: Applies for Band that the upper frequency edge of the UL Band more than 2.69 GHz  NOTE 2: Applies for Band that the upper frequency edge of the UL Band more than 5.2 GHz | | | |

#### 6.5C.3.2 Spurious emissions for UE co-existence for SUL

6.5C.3.2.1 Test purpose

To verify that UE transmitter does not cause unacceptable interference to co-existing systems for the specified bands which has specific requirements in terms of transmitter spurious emissions.

6.5C.3.2.2 Test applicability

This test applies to all types of NR UE release 15 and forward that support SUL operating on the SUL bands.

6.5C.3.2.3 Minimum conformance requirements

The requirements for NR bands for coexistence with protected bands specified in subclause 6.5.3.2.3 apply to the UE that support SUL operating on the SUL bands

The normative reference for this requirement is TS 38.101-1 [2] subclause 6.5.3.2.

6.5C.3.2.4 Test description

Same test description as specified in clause 6.5.3.2.4 with following exceptions:

- Instead of Table 5.3.5-1 🡪 use Table 5.5C-1

- Instead of Table 6.5.3.2.4.1-1🡪 use Table 6.5C.3.2.4-1

Table 6.5C.3.2.4-1: Test Configuration Table

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Initial Conditions | | | | | |
| Test Environment as specified in TS 38.508-1 [5] subclause 4.1 | | | Normal | | |
| Test Frequencies as specified in TS 38.508-1 [5] subclause 4.3.1 | | | Low range, Mid range, High range for SUL carrier  Mid range for Non-SUL carrier | | |
| Test Channel Bandwidths as specified in TS 38.508-1 [5] subclause 4.3.1 | | | Lowest, Mid, Highest for SUL carrier  Lowest for Non-SUL carrier | | |
| Test SCS as specified in Table 5.3.5-1 | | | 15kHz for SUL carrier and Lowest supported SCS for Non-SUL carrier | | |
| Test Parameters for Channel Bandwidths | | | | | |
| Test ID | Downlink Configuration | UL Configuration | | SUL Configuration | |
|  | N/A | N/A | | Modulation | RB allocation (NOTE 1) |
| 1 |  |  | | CP-OFDM QPSK | OuterFull |
| 2 |  |  | | CP-OFDM QPSK | Edge\_1RB\_Left |
| 3 |  |  | | CP-OFDM QPSK | Edge\_1RB\_Right |
| NOTE 1: The specific configuration of each RB allocation is defined in Table 6.1-1 Common UL configuration.  NOTE 2: Test Channel Bandwidths are checked separately for each SUL band combination, the applicable channel bandwidths are specified in Table 5.5C-1.  NOTE 3: For NR band n83, 30MHz test channel bandwidth is tested with Low range and High range test frequencies. | | | | | |

- Connect the SS to the UE antenna connectors as shown in TS 38.508-1 [5] Annex A, Figure A.3.1.1.4 for TE diagram and section A.3.2 for UE diagram.

- The parameter setting for the cell are set up according to the TS 38.508-1 [5] subclause 4.4.3

- Downlink signals are initially setup according to Annex C.0, C.1, C.2 and uplink signals according to Annex G.0, G.1, G.2, and G.3.0 with consideration of supplementary uplink physical channels.

- Message contents in initial conditions are according to TS 38.508-1 [5] subclause 4.3.6.1.1.2 ensuring UL/SUL indicator in Table 4.3.6.1.1.2-1 with condition SUL, subclause 4.6 ensuring Tables 4.6.1-28 with condition SUL AND (RF OR RRM), 4.6.3-14 with condition SUL\_SUL for SUL carrier, and Table 4.6.3-167 with condition PUSCH\_PUCCH\_ON\_SUL.

6.5C.3.2.5 Test requirement

Test requirements for Spurious Emissions UE Co-existence are the same as specified in clause 6.5.3.2.3.

The measured average power of spurious emission, derived in step 3, shall not exceed the described value in Table 6.5.3.2.3-1 to Table 6.5.3.2.3-4. If the UE support a band, which is not defined in the table corresponding UE’s release, the requirements for this band are taken from the table of earliest release where requirements for this band are defined. This has been described in following Table 6.5C.3.2.5-1.

Table 6.5C.3.2.5-1: UE Requirements according to UE NR release and supported NR band

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| UE Requirements per release | | | | |
| NR Band | Rel-15 | Rel-16 | R17 | R18 |
| n80 | Table 6.5.3.2.3-1 | Table 6.5.3.2.3-2 | Table 6.5.3.2.3-3 | Table 6.5.3.2.3-4 |
| n81 | Table 6.5.3.2.3-1 | Table 6.5.3.2.3-2 | Table 6.5.3.2.3-3 | Table 6.5.3.2.3-4 |
| n82 | Table 6.5.3.2.3-1 | Table 6.5.3.2.3-2 | Table 6.5.3.2.3-3 | Table 6.5.3.2.3-4 |
| n83 | Table 6.5.3.2.3-1 | Table 6.5.3.2.3-2 | Table 6.5.3.2.3-3 | Table 6.5.3.2.3-4 |
| n84 | Table 6.5.3.2.3-1 | Table 6.5.3.2.3-2 | Table 6.5.3.2.3-3 | Table 6.5.3.2.3-4 |
| n86 | Table 6.5.3.2.3-1 | Table 6.5.3.2.3-2 | Table 6.5.3.2.3-3 | Table 6.5.3.2.3-4 |
| n89 | Table 6.5.3.2.3-2 | Table 6.5.3.2.3-2 | Table 6.5.3.2.3-3 | Table 6.5.3.2.3-4 |
| n95 | Table 6.5.3.2.3-2 | Table 6.5.3.2.3-2 | Table 6.5.3.2.3-3 | Table 6.5.3.2.3-4 |
| n97 | Table 6.5.3.2.3-3 | Table 6.5.3.2.3-3 | Table 6.5.3.2.3-3 | Table 6.5.3.2.3-4 |
| n98 | Table 6.5.3.2.3-3 | Table 6.5.3.2.3-3 | Table 6.5.3.2.3-3 | Table 6.5.3.2.3-4 |
| n99 | Table 6.5.3.2.3-3 | Table 6.5.3.2.3-3 | Table 6.5.3.2.3-3 | Table 6.5.3.2.3-4 |

#### 6.5C.3.3 Additional spurious emissions for SUL

6.5C.3.3.1 Test purpose

To verify that UE transmitter does not cause unacceptable interference to other channels or other systems in terms of transmitter spurious emissions under the deployment scenarios where additional requirements are specified.

6.5C.3.3.2 Test applicability

This test applies to all types of NR UE release 15 and forward that support SUL operating on the SUL bands.

6.5C.3.3.3 Minimum conformance requirements

The additional spurious emission requirements specified in 6.5.3.3.3 apply to the UE operating on SUL bands.

The normative reference for this requirement is TS 38.101-1 [2] clause 6.5.3.3

6.5C.3.3.4 Test description

Same test description as specified in clause 6.5.3.3.4 with following exceptions:

- Instead of table 5.3.5-1 🡪 use Table 5.5C-1

- For NS\_05, instead of Table 6.5.3.3.4.1-4🡪 use Table 6.5C.3.3.4-1

- For NS\_43, instead of Table 6.5.3.3.4.1-5🡪 use Table 6.5C.3.3.4-2

- For NS\_18, instead of Table 6.5.3.3.4.1-3🡪 use Table 6.5C.3.3.4-3

- For NS\_48, instead of Table 6.5.3.3.4.1-22🡪 use Table 6.5C.3.3.4-4

- For NS\_49, instead of Table 6.5.3.3.4.1-23🡪 use Table 6.5C.3.3.4-5

- For NS\_56, instead of Table 6.5.3.3.4.1-27🡪 use Table 6.5C.3.3.4-6

Table 6.5C.3.3.4-1: Test Configuration Table (network signalling value “NS\_05”)

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Initial Conditions | | | | | | | | | |
| Test Environment as specified in TS 38.508-1 [5] subclause 4.1 | | | | Normal | | | | | |
| Test Frequencies as specified in TS 38.508-1 [5] subclause 4.3.1 | | | | Use centre frequency (Fc) as specified in test parameters for SUL carrier  Mid range for Non-SUL carrier | | | | | |
| Test Channel Bandwidths as specified in TS 38.508-1 [5] subclause 4.3.1 | | | | 5 MHz, 10 MHz, 15 MHz, 20 MHz for SUL carrier  Lowest for Non-SUL carrier | | | | | |
| Test SCS as specified in Table 5.3.5-1 | | | | 15kHz for SUL carrier and Lowest supported SCS for Non-SUL carrier | | | | | |
| Additional Spurious for SUL test parameters for NS\_05 | | | | | | | | | |
| Test ID | Fc  (MHz) | SUL  ChBw (MHz) | Downlink Config. | | Uplink Config | A-MPR | SUL Configuration | | |
| Modulation  (NOTE 2) | | RB allocation (Note 1) |
| 1 | 1922.5 | 5 | N/A | | N/A | A3 | DFT-s-OFDM | PI/2 BPSK | Outer\_Full |
| 2 | 1925 | 10 | A1 | PI/2 BPSK | Outer\_Full |
| 3 | 1925 | 10 | A7 | PI/2 BPSK | 40@10 |
| 4 | 1925 | 10 | A2 | PI/2 BPSK | 6@40 |
| 5 | 1935 | 10 | A4 | PI/2 BPSK | Outer\_Full |
| 6 | 1927.5 | 15 | A1 | PI/2 BPSK | Outer\_Full |
| 7 | 1927.5 | 15 | A7 | PI/2 BPSK | 60@19 |
| 8 | 1927.5 | 15 | A2 | PI/2 BPSK | 6@56 |
| 9 | 1932.5 | 15 | A1 | PI/2 BPSK | Outer\_Full |
| 10 | 1932.5 | 15 | A2 | PI/2 BPSK | 6@68 |
| 11 | 1942.5 | 15 | A5 | PI/2 BPSK | Outer\_Full |
| 12 | 1930 | 20 | A1 | PI/2 BPSK | Outer\_Full |
| 13 | 1930 | 20 | A7 | PI/2 BPSK | 72@28 |
| 14 | 1930 | 20 | A2 | PI/2 BPSK | 6@76 |
| 15 | 1950 | 20 | A6 | PI/2 BPSK | Outer\_Full |
| 16 | 1922.5 | 5 | A3 | QPSK | Outer\_Full |
| 17 | 1925 | 10 | A1 | QPSK | Outer\_Full |
| 18 | 1925 | 10 | A7 | QPSK | 40@10 |
| 19 | 1925 | 10 | A2 | QPSK | 6@40 |
| 20 | 1927.5 | 15 | A1 | QPSK | Outer\_Full |
| 21 | 1927.5 | 15 | A7 | QPSK | 60@19 |
| 22 | 1927.5 | 15 | A2 | QPSK | 6@56 |
| 23 | 1932.5 | 15 | A1 | QPSK | Outer\_Full |
| 24 | 1932.5 | 15 | A2 | QPSK | 6@68 |
| 25 | 1942.5 | 15 | A5 | QPSK | Outer\_Full |
| 26 | 1930 | 20 | A1 | QPSK | Outer\_Full |
| 27 | 1930 | 20 | A7 | QPSK | 72@28 |
| 28 | 1930 | 20 | A2 | QPSK | 6@76 |
| 29 | 1950 | 20 | A6 | QPSK | Outer\_Full |
| 30 | 1922.5 | 5 | A3 | 16 QAM | Outer\_Full |
| 31 | 1925 | 10 | A1 | 16 QAM | Outer\_Full |
| 32 | 1925 | 10 | A7 | 16 QAM | 40@10 |
| 33 | 1925 | 10 | A2 | 16 QAM | 6@40 |
| 34 | 1927.5 | 15 | A1 | 16 QAM | Outer\_Full |
| 35 | 1927.5 | 15 | A7 | 16 QAM | 60@19 |
| 36 | 1927.5 | 15 | A2 | 16 QAM | 6@56 |
| 37 | 1932.5 | 15 | A1 | 16 QAM | Outer\_Full |
| 38 | 1932.5 | 15 | A2 | 16 QAM | 6@68 |
| 39 | 1930 | 20 | A1 | 16 QAM | Outer\_Full |
| 40 | 1930 | 20 | A7 | 16 QAM | 72@28 |
| 41 | 1930 | 20 | A2 | 16 QAM | 6@76 |
| 42 | 1922.5 | 5 | A3 | 64 QAM | Outer\_Full |
| 43 | 1925 | 10 | A1 | 64 QAM | Outer\_Full |
| 44 | 1925 | 10 | A7 | 64 QAM | 40@10 |
| 45 | 1925 | 10 | A2 | 64 QAM | 6@40 |
| 46 | 1927.5 | 15 | A1 | 64 QAM | Outer\_Full |
| 47 | 1927.5 | 15 | A7 | 64 QAM | 60@19 |
| 48 | 1927.5 | 15 | A2 | 64 QAM | 6@56 |
| 49 | 1932.5 | 15 | A1 | 64 QAM | Outer\_Full |
| 50 | 1932.5 | 15 | A2 | 64 QAM | 6@68 |
| 51 | 1930 | 20 | A1 | 64 QAM | Outer\_Full |
| 52 | 1930 | 20 | A7 | 64 QAM | 72@28 |
| 53 | 1930 | 20 | A2 | 64 QAM | 6@76 |
| 54 | 1922.5 | 5 | A3 | 256 QAM | Outer\_Full |
| 55 | 1925 | 10 | A1 | 256 QAM | Outer\_Full |
| 56 | 1925 | 10 | A7 | 256 QAM | 40@10 |
| 57 | 1925 | 10 | A2 | 256 QAM | 6@40 |
| 58 | 1927.5 | 15 | A1 | 256 QAM | Outer\_Full |
| 59 | 1927.5 | 15 | A7 | 256 QAM | 60@19 |
| 60 | 1927.5 | 15 | A2 | 256 QAM | 6@56 |
| 61 | 1932.5 | 15 | A1 | 256 QAM | Outer\_Full |
| 62 | 1932.5 | 15 | A2 | 256 QAM | 6@68 |
| 63 | 1930 | 20 | A1 | 256 QAM | Outer\_Full |
| 64 | 1930 | 20 | A7 | 256 QAM | 72@28 |
| 65 | 1930 | 20 | A2 | 256 QAM | 6@76 |
| 66 | 1922.5 | 5 | A3 | CP-OFDM | QPSK | Outer\_Full |
| 67 | 1925 | 10 | A1 | QPSK | Outer\_Full |
| 68 | 1925 | 10 | A7 | QPSK | 42@10 |
| 69 | 1925 | 10 | A2 | QPSK | 6@40 |
| 70 | 1935 | 10 | A4 | QPSK | Outer\_Full |
| 71 | 1927.5 | 15 | A1 | QPSK | Outer\_Full |
| 72 | 1927.5 | 15 | A7 | QPSK | 60@19 |
| 73 | 1927.5 | 15 | A2 | QPSK | 6@56 |
| 74 | 1932.5 | 15 | A1 | QPSK | Outer\_Full |
| 75 | 1932.5 | 15 | A2 | QPSK | 6@68 |
| 76 | 1942.5 | 15 | A5 | QPSK | Outer\_Full |
| 77 | 1930 | 20 | A1 | QPSK | Outer\_Full |
| 78 | 1930 | 20 | A7 | QPSK | 78@28 |
| 79 | 1930 | 20 | A2 | QPSK | 6@76 |
| 80 | 1950 | 20 | A6 | QPSK | Outer\_Full |
| 81 | 1922.5 | 5 | A3 | 16 QAM | Outer\_Full |
| 82 | 1925 | 10 | A1 | 16 QAM | Outer\_Full |
| 83 | 1925 | 10 | A7 | 16 QAM | 42@10 |
| 84 | 1925 | 10 | A2 | 16 QAM | 6@40 |
| 85 | 1935 | 10 | A4 | 16 QAM | Outer\_Full |
| 86 | 1927.5 | 15 | A1 | 16 QAM | Outer\_Full |
| 87 | 1927.5 | 15 | A7 | 16 QAM | 60@19 |
| 88 | 1927.5 | 15 | A2 | 16 QAM | 6@56 |
| 89 | 1932.5 | 15 | A1 | 16 QAM | Outer\_Full |
| 90 | 1932.5 | 15 | A2 | 16 QAM | 6@68 |
| 91 | 1942.5 | 15 | A5 | 16 QAM | Outer\_Full |
| 92 | 1930 | 20 | A1 | 16 QAM | Outer\_Full |
| 93 | 1930 | 20 | A7 | 16 QAM | 78@28 |
| 94 | 1930 | 20 | A2 | 16 QAM | 6@76 |
| 95 | 1950 | 20 | A6 | 16 QAM | Outer\_Full |
| 96 | 1922.5 | 5 | A3 | 64 QAM | Outer\_Full |
| 97 | 1925 | 10 | A1 | 64 QAM | Outer\_Full |
| 98 | 1925 | 10 | A7 | 64 QAM | 42@10 |
| 99 | 1925 | 10 | A2 | 64 QAM | 6@40 |
| 100 | 1927.5 | 15 | A1 | 64 QAM | Outer\_Full |
| 101 | 1927.5 | 15 | A7 | 64 QAM | 60@19 |
| 102 | 1927.5 | 15 | A2 | 64 QAM | 6@56 |
| 103 | 1932.5 | 15 | A1 | 64 QAM | Outer\_Full |
| 104 | 1932.5 | 15 | A2 | 64 QAM | 6@68 |
| 105 | 1930 | 20 | A1 | 64 QAM | Outer\_Full |
| 106 | 1930 | 20 | A7 | 64 QAM | 78@28 |
| 107 | 1930 | 20 | A2 | 64 QAM | 6@76 |
| 108 | 1922.5 | 5 | A3 | 256 QAM | Outer\_Full |
| 109 | 1925 | 10 | A1 | 256 QAM | Outer\_Full |
| 110 | 1925 | 10 | A7 | 256 QAM | 42@10 |
| 111 | 1927.5 | 15 | A1 | 256 QAM | Outer\_Full |
| 112 | 1927.5 | 15 | A7 | 256 QAM | 60@19 |
| 113 | 1932.5 | 15 | A1 | 256 QAM | Outer\_Full |
| 114 | 1930 | 20 | A1 | 256 QAM | Outer\_Full |
| 115 | 1930 | 20 | A7 | 256 QAM | 78@28 |
| NOTE 1: The specific configuration of each RB allocation is defined in Table 6.1-1 unless otherwise stated in this table.  NOTE 2: DFT-s-OFDM PI/2 BPSK test applies only for UEs which supports half Pi BPSK in FR1.  NOTE 3: AMPR requirement for NS\_05 is specified in 6.2.3.3.4. | | | | | | | | | |

Table 6.5C.3.3.4-2: Test Configuration Table (network signalling value “NS\_43”)

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Initial Conditions | | | | | | | |
| Test Environment as specified in TS 38.508-1 [5] subclause 4.1 | | | | | | Normal | |
| Test Frequencies as specified in TS 38.508-1 [5] subclause 4.3.1 | | | | | | Use carrier centre frequency (Fc) as specified in test parameters for SUL carrier  Mid range for Non-SUL carrier | |
| Test Channel Bandwidths as specified in TS 38.508-1 [5] subclause 4.3.1 | | | | | | 5 MHz, 10 MHz, 15 MHz for SUL carrier  Lowest for Non-SUL carrier | |
| Test SCS as specified in Table 5.3.5-1 | | | | | | 15 kHz for SUL carrier and Lowest supported SCS for Non-SUL carrier | |
| Additional Spurious for SUL test parameters for NS\_43 | | | | | | | |
| Test ID | Fc (MHz) | SUL  Ch BW (MHz) | Downlink Configuration | Uplink Configuration | SUL Configuration | | |
| Modulation  (Note 2) | | RB allocation (Note 1) |
| 1 | 910 | 10 | N/A | N/A | DFT-s--OFDM | PI/2 BPSK | Outer\_Full (A2) |
| 2 | 907.5 | 15 | PI/2 BPSK | Edge\_1RB\_Left (A6) |
| 3 | 907.5 | 15 | PI/2 BPSK | Outer\_Full (A6) |
| 4 | 902.5 | 5 | QPSK | Outer\_Full (A1) |
| 5 | 910 | 10 | QPSK | Outer\_Full (A4) |
| 6 | 907.5 | 15 | QPSK | Edge\_1RB\_Left (A6) |
| 7 | 907.5 | 15 | QPSK | Outer\_Full (A6) |
| 8 | 910 | 10 | 16 QAM | Outer\_Full (A5) |
| 9 | 907.5 | 15 | 16 QAM | Edge\_1RB\_Left (A6) |
| 10 | 907.5 | 15 | 16 QAM | Outer\_Full (A6) |
| 11 | 910 | 10 | 64 QAM | Outer\_Full (A3) |
| 12 | 907.5 | 15 | 64 QAM | Edge\_1RB\_Left (A6) |
| 13 | 907.5 | 15 | 64 QAM | Outer\_Full (A6) |
| 14 | 907.5 | 15 | 256 QAM | Edge\_1RB\_Left (A6) |
| 15 | 907.5 | 15 | 256 QAM | Outer\_Full (A6) |
| 16 | 902.5 | 5 | CP-OFDM | QPSK | Outer\_Full (A1) |
| 17 | 910 | 10 | QPSK | Outer\_Full (A5) |
| 18 | 907.5 | 15 | QPSK | Edge\_1RB\_Left (A6) |
| 19 | 907.5 | 15 | QPSK | Outer\_Full (A6) |
| 20 | 902.5 | 5 | 16 QAM | Outer\_Full (A1) |
| 21 | 910 | 10 | 16 QAM | Outer\_Full (A5) |
| 22 | 907.5 | 15 | 16 QAM | Edge\_1RB\_Left (A6) |
| 23 | 907.5 | 15 | 16 QAM | Outer\_Full (A6) |
| 24 | 910 | 10 | 64 QAM | Outer\_Full (A3) |
| 25 | 907.5 | 15 | 64 QAM | Edge\_1RB\_Left (A6) |
| 26 | 907.5 | 15 | 64 QAM | Outer\_Full (A6) |
| 27 | 907.5 | 15 | 256 QAM | Edge\_1RB\_Left (A6) |
| 28 | 907.5 | 15 | 256 QAM | Outer\_Full (A6) |
| NOTE 1: The specific configuration of each RB allocation is defined in Table 6.1-1 unless otherwise stated in this table.  NOTE 2: DFT-s-OFDM PI/2 BPSK test applies only for UEs which supports half Pi BPSK in FR1.  NOTE 2: AMPR requirement for NS\_43 is specified in 6.2.3.3.6. | | | | | | | |

Table 6.5C.3.3.4-3: Test Configuration Table (network signalling value “NS\_18”)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Initial Conditions | | | | | | |
| Test Environment as specified in TS 38.508-1 [5] subclause 4.1 | | | | Normal | | |
| Test Frequencies as specified in TS 38.508-1 [5] subclause 4.3.1 | | | | Low range for SUL carrier  Mid range for Non-SUL carrier | | |
| Test Channel Bandwidths as specified in TS 38.508-1 [5] subclause 4.3.1 | | | | 5MHz 10MHz 20MHz 30MHz for SUL carrier  Lowest for Non-SUL carrier | | |
| Test SCS as specified in Table 5.3.5-1 | | | | 15 kHz for SUL carrier and Lowest supported SCS for Non-SUL carrier | | |
| A-MPR test parameters for NS\_18 | | | | | | |
| Test ID | ChBw  SCS | Downlink Configuration | SUL Configuration | | | |
| Modulation  (Note 2) | | RB allocation (Note 1) | Comment |
| 1 | 5MHz, 10MHz, 20MHz | N/A | DFT-s OFDM | QPSK | Edge\_1RB\_Left | A1, A2 |
| 2 | QPSK | Outer\_Full | A1, A2 |
| 3 | 16 QAM | Edge\_1RB\_Left | A1, A2 |
| 4 | 16 QAM | Outer\_Full | A1, A2 |
| 5 | 64 QAM | Edge\_1RB\_Left | A1, A2 |
| 6 | 64 QAM | Outer\_Full | A1, A2 |
| 7 | 256 QAM | Edge\_1RB\_Left | A1, A2 |
| 8 | 256 QAM | Outer\_Full | A1, A2 |
| 9 | CP-s OFDM | QPSK | Edge\_1RB\_Left | A1, A2 |
| 10 | QPSK | Outer\_Full | A1, A2 |
| 11 | 16 QAM | Edge\_1RB\_Left | A1, A2 |
| 12 | 16 QAM | Outer\_Full | A1, A2 |
| 13 | 64 QAM | Edge\_1RB\_Left | A1, A2 |
| 14 | 64 QAM | Outer\_Full | A1, A2 |
| 15 | 256 QAM | Edge\_1RB\_Left | A1, A2 |
| 16 | 256 QAM | Outer\_Full | A1, A2 |
| 17 | 30MHz | DFT-s OFDM | 256 QAM | 81@70 | A3 |
| 18 | 256 QAM | Outer\_Full | A4 |
| 19 | CP-s OFDM | 256 QAM | 87@73 | A3 |
| 20 | 256 QAM | Outer\_Full | A4 |
| NOTE 1: The specific configuration of each RB allocation is defined in Table 6.1-1 unless otherwise stated in this table. | | | | | | |

Table 6.5C.3.3.4-4: Test Configuration Table (network signalling value “NS\_48”)

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Initial Conditions | | | | | | | |
| Test Environment as specified in TS 38.508-1 [5] subclause 4.1 | | | | | Normal | | |
| Test Frequencies as specified in TS 38.508-1 [5] subclause 4.3.1 | | | | | Low range, High range for SUL carrier  Mid range for non-SUL carrier | | |
| Test Channel Bandwidths as specified in TS 38.508-1 [5] subclause 4.3.1 | | | | | 25 MHz, 30MHz, 40MHz, 50MHz for SUL carrier  Lowest for non-SUL carrier | | |
| Test SCS as specified in Table 5.3.5-1 | | | | | 15 kHz for SUL carrier and Lowest supported SCS for Non-SUL carrier | | |
| A-MPR test parameters for NS\_48 | | | | | | | |
| Test ID | Fc (MHz) | Ch BW (MHz) | Uplink Configuration | Downlink Configuration | SUL Configuration | | |
| Modulation  (Note 2) | | RB allocation (Note 1) |
| 1 | Default | 25 | N/A | N/A | DFT-s-OFDM | QPSK | Outer\_Full (A3) |
| 2 | Default | 25 | QPSK | Edge\_1RB\_Right (A3) |
| 3 | Default | 30 | QPSK | Outer\_Full (A3) |
| 4 | Default | 30 | QPSK | Edge\_1RB\_Right (A5) |
| 5 | Default | 40 | QPSK | 16@0 (A2) |
| 6 | Default | 40 | QPSK | 90@0 (A3) |
| 7 | Default | 40 | QPSK | 150@0 (A4) |
| 8 | Default | 40 | QPSK | 192@0 (A2) |
| 9 | Default | 40 | QPSK | 5@187 (A3) |
| 10 | Default | 40 | QPSK | Outer\_Full (A1) |
| 11 | Default | 50 | QPSK | 32@0 (A2) |
| 12 | Default | 50 | QPSK | 108@0 (A4) |
| 13 | Default | 50 | QPSK | 225@0 (A2) |
| 14 | Default | 50 | QPSK | 5@223 (A5) |
| 15 | Default | 50 | QPSK | Outer\_Full (A1) |
| 16 | Default | 25 | 256 QAM | Outer\_Full (A3) |
| 17 | Default | 25 | 256 QAM | Edge\_1RB\_Right (A3) |
| 18 | Default | 30 | 256 QAM | Outer\_Full (A3) |
| 19 | Default | 30 | 256 QAM | Edge\_1RB\_Right (A5) |
| 20 | Default | 40 | 256 QAM | 16@0 (A2) |
| 21 | Default | 40 | 256 QAM | 90@0 (A3) |
| 22 | Default | 40 | 256 QAM | 150@0 (A4) |
| 23 | Default | 40 | 256 QAM | 192@0 (A2) |
| 24 | Default | 40 | 256 QAM | 5@187 (A3) |
| 25 | Default | 40 | 256 QAM | Outer\_Full (A1) |
| 26 | Default | 50 | 256 QAM | 32@0 (A2) |
| 27 | Default | 50 | 256 QAM | 108@0 (A4) |
| 28 | Default | 50 | 256 QAM | 225@0 (A2) |
| 29 | Default | 50 | 256 QAM | 5@223 (A5) |
| 30 | Default | 50 | 256 QAM | Outer\_Full (A1) |
| 31 | Default | 25 | CP-OFDM | QPSK | Outer\_Full (A3) |
| 32 | Default | 25 | QPSK | Edge\_1RB\_Right (A3) |
| 33 | Default | 30 | QPSK | Outer\_Full (A3) |
| 34 | Default | 30 | QPSK | Edge\_1RB\_Right (A5) |
| 35 | Default | 40 | QPSK | 16@0 (A2) |
| 36 | Default | 40 | QPSK | 95@0 (A3) |
| 37 | Default | 40 | QPSK | 152@0 (A4) |
| 38 | Default | 40 | QPSK | 192@0 (A2) |
| 39 | Default | 40 | QPSK | 5@187 (A3) |
| 40 | Default | 40 | QPSK | Outer\_Full (A1) |
| 41 | Default | 50 | QPSK | 34@0 (A2) |
| 42 | Default | 50 | QPSK | 115@0 (A4) |
| 43 | Default | 50 | QPSK | 228@0 (A2) |
| 44 | Default | 50 | QPSK | 5@223 (A5) |
| 45 | Default | 50 | QPSK | Outer\_Full (A1) |
| 46 | Default | 25 | 256 QAM | Outer\_Full (A3) |
| 47 | Default | 25 | 256 QAM | Edge\_1RB\_Right (A3) |
| 48 | Default | 30 | 256 QAM | Outer\_Full (A3) |
| 49 | Default | 30 | 256 QAM | Edge\_1RB\_Right (A5) |
| 50 | Default | 40 | 256 QAM | 16@0 (A2) |
| 51 | Default | 40 | 256 QAM | 95@0 (A3) |
| 52 | Default | 40 | 256 QAM | 152@0 (A4) |
| 53 | Default | 40 | 256 QAM | 192@0 (A2) |
| 54 | Default | 40 | 256 QAM | 5@187 (A3) |
| 55 | Default | 40 | 256 QAM | Outer\_Full (A1) |
| 56 | Default | 50 | 256 QAM | 34@0 (A2) |
| 57 | Default | 50 | 256 QAM | 115@0 (A4) |
| 58 | Default | 50 | 256 QAM | 228@0 (A2) |
| 59 | Default | 50 | 256 QAM | 5@223 (A5) |
| 60 | Default | 50 | 256 QAM | Outer\_Full (A1) |
| NOTE 1: The specific configuration of each RB allocation is defined in Table 6.1-1 unless otherwise stated in this table. | | | | | | | |

Table 6.5C.3.3.4-5: Test Configuration Table (network signalling value “NS\_49”)

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Initial Conditions | | | | | | | |
| Test Environment as specified in TS 38.508-1 [5] subclause 4.1 | | | | Normal | | | |
| Test Frequencies as specified in TS 38.508-1 [5] subclause 4.3.1 | | | | Low range, High range for SUL carrier  Mid range for non-SUL carrier | | | |
| Test Channel Bandwidths as specified in TS 38.508-1 [5] subclause 4.3.1 | | | | 25 MHz, 30MHz, 40MHz, 50MHz for SUL carrier  Lowest for non-SUL carrier | | | |
| Test SCS as specified in Table 5.3.5-1 | | | | 15 kHz for SUL carrier and Lowest supported SCS for Non-SUL carrier | | | |
| A-MPR test parameters for NS\_49 | | | | | | | |
| Test ID | Fc (MHz) | Ch BW (MHz) | Downlink Configuration | Uplink Configuration | SUL Configuration | | |
| Modulation  (Note 2) | | RB allocation (Note 1) |
| 1 | Default | 25 | N/A | N/A | DFT-s-OFDM | QPSK | Outer\_Full (A3) |
| 2 | Default | 25 | QPSK | Edge\_1RB\_Right (A3) |
| 3 | Default | 25 | QPSK | Edge\_1RB\_Left (A3) |
| 4 | Default | 30 | QPSK | 20@0 (A1) |
| 5 | Default | 30 | QPSK | 36@0 (A5) |
| 6 | Default | 30 | QPSK | 80@0 (A3) |
| 7 | Default | 30 | QPSK | 120@0 (A4) |
| 8 | Default | 30 | QPSK | Outer\_Full (A2) |
| 9 | Default | 30 | QPSK | Edge\_1RB\_Right (A5) |
| 10 | Default | 40 | QPSK | 40@0 (A1) |
| 11 | Default | 40 | QPSK | 5@53 (A5) |
| 12 | Default | 40 | QPSK | 100@0 (A4) |
| 13 | Default | 40 | QPSK | 150@33 (A2) |
| 14 | Default | 40 | QPSK | 5@187 (A5) |
| 15 | Default | 40 | QPSK | 192@0 (A1) |
| 16 | Default | 40 | QPSK | Outer\_Full (A1) |
| 17 | Default | 50 | QPSK | 5@75 (A5) |
| 18 | Default | 50 | QPSK | 5@215 (A5) |
| 19 | Default | 50 | QPSK | 162@45 (A2) |
| 20 | Default | 50 | QPSK | 220@0 (A1) |
| 21 | Default | 50 | QPSK | Outer\_Full (A1) |
| 22 | Default | 25 | 256 QAM | Outer\_Full (A3) |
| 23 | Default | 25 | 256 QAM | Edge\_1RB\_Right (A3) |
| 24 | Default | 25 | 256 QAM | Edge\_1RB\_Left (A3) |
| 25 | Default | 30 | 256 QAM | 20@0 (A1) |
| 26 | Default | 30 | 256 QAM | 36@0 (A5) |
| 27 | Default | 30 | 256 QAM | 80@0 (A3) |
| 28 | Default | 30 | 256 QAM | 120@0 (A4) |
| 29 | Default | 30 | 256 QAM | Outer\_Full (A2) |
| 30 | Default | 30 | 256 QAM | Edge\_1RB\_Right (A5) |
| 31 | Default | 40 | 256 QAM | 40@0 (A1) |
| 32 | Default | 40 | 256 QAM | 5@53 (A5) |
| 33 | Default | 40 | 256 QAM | 100@0 (A4) |
| 34 | Default | 40 | 256 QAM | 150@33 (A2) |
| 35 | Default | 40 | 256 QAM | 5@187 (A5) |
| 36 | Default | 40 | 256 QAM | 192@0 (A1) |
| 37 | Default | 40 | 256 QAM | Outer\_Full (A1) |
| 38 | Default | 50 | 256 QAM | 5@75 (A5) |
| 39 | Default | 50 | 256 QAM | 5@215 (A5) |
| 40 | Default | 50 | 256 QAM | 162@45 (A2) |
| 41 | Default | 50 | 256 QAM | 216@0 (A1) |
| 42 | Default | 50 | 256 QAM | Outer\_Full (A1) |
| 43 | Default | 25 | CP-OFDM | QPSK | Outer\_Full (A3) |
| 44 | Default | 25 | QPSK | Edge\_1RB\_Right (A3) |
| 45 | Default | 25 | QPSK | Edge\_1RB\_Left (A3) |
| 46 | Default | 30 | QPSK | 20@0 (A1) |
| 47 | Default | 30 | QPSK | 36@0 (A5) |
| 48 | Default | 30 | QPSK | 80@0 (A3) |
| 49 | Default | 30 | QPSK | 120@0 (A4) |
| 50 | Default | 30 | QPSK | Outer\_Full (A2) |
| 51 | Default | 30 | QPSK | Edge\_1RB\_Right (A5) |
| 52 | Default | 40 | QPSK | 40@0 (A1) |
| 53 | Default | 40 | QPSK | 5@53 (A5) |
| 54 | Default | 40 | QPSK | 100@0 (A4) |
| 55 | Default | 40 | QPSK | 159@33 (A2) |
| 56 | Default | 40 | QPSK | 5@187 (A5) |
| 57 | Default | 40 | QPSK | 192@0 (A1) |
| 58 | Default | 40 | QPSK | Outer\_Full (A1) |
| 59 | Default | 50 | QPSK | 5@75 (A5) |
| 60 | Default | 50 | QPSK | 5@215 (A5) |
| 61 | Default | 50 | QPSK | 175@45 (A2) |
| 62 | Default | 50 | QPSK | 216@0 (A1) |
| 63 | Default | 50 | QPSK | Outer\_Full (A1) |
| 64 | Default | 25 | 256 QAM | Outer\_Full (A3) |
| 65 | Default | 25 | 256 QAM | Edge\_1RB\_Right (A3) |
| 66 | Default | 25 | 256 QAM | Edge\_1RB\_Left (A3) |
| 67 | Default | 30 | 256 QAM | 20@0 (A1) |
| 68 | Default | 30 | 256 QAM | 36@0 (A5) |
| 69 | Default | 30 | 256 QAM | 80@0 (A3) |
| 70 | Default | 30 | 256 QAM | 120@0 (A4) |
| 71 | Default | 30 | 256 QAM | Outer\_Full (A2) |
| 72 | Default | 30 | 256 QAM | Edge\_1RB\_Right (A5) |
| 73 | Default | 40 | 256 QAM | 40@0 (A1) |
| 74 | Default | 40 | 256 QAM | 5@53 (A5) |
| 75 | Default | 40 | 256 QAM | 100@0 (A4) |
| 76 | Default | 40 | 256 QAM | 150@33 (A2) |
| 77 | Default | 40 | 256 QAM | 5@187 (A5) |
| 78 | Default | 40 | 256 QAM | 192@0 (A1) |
| 79 | Default | 40 | 256 QAM | Outer\_Full (A1) |
| 80 | Default | 50 | 256 QAM | 5@75 (A5) |
| 81 | Default | 50 | 256 QAM | 5@215 (A5) |
| 82 | Default | 50 | 256 QAM | 175@45 (A2) |
| 83 | Default | 50 | 256 QAM | 220@0 (A1) |
| 84 | Default | 50 | 256 QAM | Outer\_Full (A1) |
| NOTE 1: The specific configuration of each RB allocation is defined in Table 6.1-1 unless otherwise stated in this table. | | | | | | | |

Table 6.5C.3.3.4-6: Test Configuration Table (network signalled value “NS\_56”)

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Initial Conditions | | | | | | | | |
| Test Environment as specified in TS 38.508-1 [5] subclause 4.1 | | | | | | | Normal | |
| Test Frequencies as specified in TS 38.508-1 [5] subclause 4.3.1 | | | | | | | Use uplink carrier centre frequency (Fc) as specified in test parameters | |
| Test Channel Bandwidths as specified in TS 38.508-1 [5] subclause 4.3.1 | | | | | | | 5 MHz, 10 MHz as specified in test parameters for SUL carrier  Lowest for non-SUL carrier | |
| Test SCS as specified in Table 5.3.5-1 | | | | | | | 15 kHz for SUL carrier and Lowest supported SCS for Non-SUL carrier | |
| A-MPR test parameters for NS\_56 | | | | | | | | |
| Test ID | Fc  (MHz) | ChBw (MHz) | Downlink Configuration | Uplink Configuration | A-MPR | Uplink Configuration | | |
| Modulation  (NOTE 2) | | RB allocation (Note 1) |
| SCS 15 kHz |
| 1 | Low | 5 | N/A for A-MPR testing | N/A | 14 | DFT-s-OFDM | PI/2 BPSK | Edge\_1RB\_Left |
| 2 | Low | 5 | 6 | PI/2 BPSK | Outer\_Full |
| 3 | Low | 5 | 4 | PI/2 BPSK | 20@4 |
| 4 | Low | 5 | 4 | PI/2 BPSK | 1@4 |
| 5 | Low | 5 | 14 | QPSK | Edge\_1RB\_Left |
| 6 | Low | 5 | 6 | QPSK | Outer\_Full |
| 7 | Low | 5 | 4 | QPSK | 20@4 |
| 8 | Low | 5 | 4 | QPSK | 1@4 |
| 9 | Low | 5 | 14 | 16 QAM | Edge\_1RB\_Left |
| 10 | Low | 5 | 6 | 16 QAM | Outer\_Full |
| 11 | Low | 5 | 4 | 16 QAM | 20@4 |
| 12 | Low | 5 | 4 | 16 QAM | 1@4 |
| 13 | Low | 5 | 14 | 64 QAM | Edge\_1RB\_Left |
| 14 | Low | 5 | 6 | 64 QAM | Outer\_Full |
| 15 | Low | 5 | 4 | 64 QAM | 20@4 |
| 16 | Low | 5 | 4 | 64 QAM | 1@4 |
| 17 | Low | 5 | 14 | 256 QAM | Edge\_1RB\_Left |
| 18 | Low | 5 | 6 | 256 QAM | Outer\_Full |
| 19 | Low | 5 | 4 | 256 QAM | 20@4 |
| 20 | Low | 5 | 4 | 256 QAM | 1@4 |
| 21 | Low | 10 | 12 | PI/2 BPSK | Edge\_1RB\_Left |
| 22 | Low | 10 | 8 | PI/2 BPSK | Outer\_Full |
| 23 | Low | 10 | 6 | PI/2 BPSK | 1@3 |
| 24 | Low | 10 | 6 | PI/2 BPSK | 40@9 |
| 25 | Low | 10 | 4 | PI/2 BPSK | 1@35 |
| 26 | Low | 10 | 2 | PI/2 BPSK | 16@35 |
| 27 | Low | 10 | 5 | PI/2 BPSK | Edge\_1RB\_Right |
| 28 | Low | 10 | 5 | PI/2 BPSK | 1@40 |
| 29 | Low | 10 | 3 | PI/2 BPSK | 8@44 |
| 30 | Low | 10 | 12 | QPSK | Edge\_1RB\_Left |
| 31 | Low | 10 | 8 | QPSK | Outer\_Full |
| 32 | Low | 10 | 6 | QPSK | 1@3 |
| 33 | Low | 10 | 6 | QPSK | 40@9 |
| 34 | Low | 10 | 4 | QPSK | 1@35 |
| 35 | Low | 10 | 2 | QPSK | 16@35 |
| 36 | Low | 10 | 5 | QPSK | Edge\_1RB\_Right |
| 37 | Low | 10 | 5 | QPSK | 1@40 |
| 38 | Low | 10 | 3 | QPSK | 8@44 |
| 39 | Low | 10 | 12 | 16 QAM | Edge\_1RB\_Left |
| 40 | Low | 10 | 8 | 16 QAM | Outer\_Full |
| 41 | Low | 10 | 6 | 16 QAM | 1@3 |
| 42 | Low | 10 | 6 | 16 QAM | 40@9 |
| 43 | Low | 10 | 4 | 16 QAM | 1@35 |
| 44 | Low | 10 | 2 | 16 QAM | 16@35 |
| 45 | Low | 10 | 5 | 16 QAM | Edge\_1RB\_Right |
| 46 | Low | 10 | 5 | 16 QAM | 1@40 |
| 47 | Low | 10 | 3 | 16 QAM | 8@44 |
| 48 | Low | 10 | 12 | 64 QAM | Edge\_1RB\_Left  Outer\_Full |
| 49 | Low | 10 | 8 | 64 QAM |
| 50 | Low | 10 | 6 | 64 QAM | 1@3  40@9 |
| 51 | Low | 10 | 6 | 64 QAM |
| 52 | Low | 10 | 4 | 64 QAM | 1@35 |
| 53 | Low | 10 | 2 | 64 QAM | 16@35 |
| 54 | Low | 10 | 5 | 64 QAM | Edge\_1RB\_Right |
| 55 | Low | 10 | 5 | 64 QAM | 1@40 |
| 56 | Low | 10 | 3 | 64 QAM | 8@44 |
| 57 | Low | 10 | 12 | 256 QAM | Edge\_1RB\_Left |
| 58 | Low | 10 | 8 | 256 QAM | Outer\_Full |
| 59 | Low | 10 | 6 | 256 QAM | 1@3 |
| 60 | Low | 10 | 6 | 256 QAM | 40@9 |
| 61 | Low | 10 | 4 | 256 QAM | 1@35 |
| 62 | Low | 10 | 2 | 256 QAM | 16@35 |
| 63 | Low | 10 | 5 | 256 QAM | Edge\_1RB\_Right |
| 64 | Low | 10 | 5 | 256 QAM | 1@40 |
| 65 | Low | 10 | 3 | 256 QAM | 8@44 |
| 66 | Low | 5 | N/A for A-MPR testing | N/A | 14 | CP-OFDM | QPSK | Edge\_1RB\_Left |
| 67 | Low | 5 | 6 | QPSK | Outer\_Full |
| 68 | Low | 5 | 4 | QPSK | 21@4 |
| 69 | Low | 5 | 4 | QPSK | 1@4 |
| 70 | Low | 5 | 14 | 16 QAM | Edge\_1RB\_Left |
| 71 | Low | 5 | 6 | 16 QAM | Outer\_Full |
| 72 | Low | 5 | 4 | 16 QAM | 21@4 |
| 73 | Low | 5 | 4 | 16 QAM | 1@4 |
| 74 | Low | 5 | 14 | 64 QAM | Edge\_1RB\_Left |
| 75 | Low | 5 | 6 | 64 QAM | Outer\_Full |
| 76 | Low | 5 | 4 | 64 QAM | 21@4 |
| 77 | Low | 5 | 4 | 64 QAM | 1@4 |
| 78 | Low | 5 | 14 | 256 QAM | Edge\_1RB\_Left |
| 79 | Low | 5 | 6 | 256 QAM | Outer\_Full |
| 80 | Low | 5 | 4 | 256 QAM | 21@4 |
| 81 | Low | 5 | 4 | 256 QAM | 1@4 |
| 82 | Low | 10 | 12 | QPSK | Edge\_1RB\_Left |
| 83 | Low | 10 | 8 | QPSK | Outer\_Full |
| 84 | Low | 10 | 6 | QPSK | 1@3 |
| 85 | Low | 10 | 6 | QPSK | 43@9 |
| 86 | Low | 10 | 4 | QPSK | 1@35 |
| 87 | Low | 10 | 2 | QPSK | 17@35 |
| 88 | Low | 10 | 5 | QPSK | Edge\_1RB\_Right |
| 89 | Low | 10 | 5 | QPSK | 1@40 |
| 90 | Low | 10 | 3 | QPSK | 8@44 |
| 91 | Low | 10 | 12 | 16 QAM | Edge\_1RB\_Left |
| 92 | Low | 10 | 8 | 16 QAM | Outer\_Full |
| 93 | Low | 10 | 6 | 16 QAM | 1@3 |
| 94 | Low | 10 | 6 | 16 QAM | 43@9 |
| 95 | Low | 10 | 4 | 16 QAM | 1@35 |
| 96 | Low | 10 | 2 | 16 QAM | 17@35 |
| 97 | Low | 10 | 5 | 16 QAM | Edge\_1RB\_Right |
| 98 | Low | 10 | 5 | 16 QAM | 1@40 |
| 99 | Low | 10 | 3 | 16 QAM | 8@44 |
| 100 | Low | 10 | 12 | 64 QAM | Edge\_1RB\_Left |
| 101 | Low | 10 | 8 | 64 QAM | Outer\_Full |
| 102 | Low | 10 | 6 | 64 QAM | 1@3 |
| 103 | Low | 10 | 6 | 64 QAM | 43@9 |
| 104 | Low | 10 | 4 | 64 QAM | 1@35 |
| 105 | Low | 10 | 2 | 64 QAM | 17@35 |
| 106 | Low | 10 | 5 | 64 QAM | Edge\_1RB\_Right |
| 107 | Low | 10 | 5 | 64 QAM | 1@40 |
| 108 | Low | 10 | 3 | 64 QAM | 8@44 |
| 109 | Low | 10 | 12 | 256 QAM | Edge\_1RB\_Left |
| 110 | Low | 10 | 8 | 256 QAM | Outer\_Full |
| 111 | Low | 10 | 6 | 256 QAM | 1@3 |
| 112 | Low | 10 | 6 | 256 QAM | 43@9 |
| 113 | Low | 10 | 4 | 256 QAM | 1@35 |
| 114 | Low | 10 | 2 | 256 QAM | 17@35 |
| 115 | Low | 10 | 5 | 256 QAM | Edge\_1RB\_Right |
| 116 | Low | 10 | 5 | 256 QAM | 1@40 |
| 117 | Low | 10 | 3 | 256 QAM | 8@44 |
| NOTE 1: The specific configuration of each RB allocation is defined in Table 6.1-1 unless otherwise stated in this table.  NOTE 2: DFT-s-OFDM PI/2 BPSK test applies only for UEs which supports half Pi BPSK in FR1. | | | | | | | | |

- Connect the SS to the UE antenna connectors as shown in TS 38.508-1 [5] Annex A, Figure A.3.1.1.4 for TE diagram and section A.3.2 for UE diagram.

- The parameter setting for the cell are set up according to the TS 38.508-1 [5] subclause 4.4.3

- Downlink signals are initially setup according to Annex C.0, C.1, C.2 and uplink signals according to Annex G.0, G.1, G.2, and G.3.0 with consideration of supplementary uplink physical channels.

Message contents in initial conditions are according to TS 38.508-1 [5] subclause 4.3.6.1.1.2 ensuring UL/SUL indicator in Table 4.3.6.1.1.2-1 with condition SUL, subclause 4.6 ensuring Table 4.6.1-28 with condition SUL AND (RF OR RRM), Tables 4.6.3-14 with condition SUL\_SUL for SUL carrier, and Table 4.6.3-167 with condition PUSCH\_PUCCH\_ON\_SUL, together with exceptions as specified in clause 6.5.3.3.4.3 as appropriate for different NS values.

Table 6.5C.3.3.4-2: Void

6.5C.3.3.5 Test requirement

For SUL operation, the Additional Spurious emission requirement specified in clause 6.5.3.3.5 shall be met for specific NS values.

Table 6.5C.3.3.5-1: Void

### 6.5C.4 Transmit intermodulation for SUL

6.5C.4.1 Test purpose

To verify that the UE transmit intermodulation does not exceed the described value in the test requirement.

The transmit intermodulation performance 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 wanted signal and an interfering signal reaching the transmitter via the antenna.

6.5C.4.2 Test applicability

This test applies to all types of NR UE release 15 and forward that support SUL operating on the SUL bands.

6.5C.4.3 Minimum conformance requirements

The requirements in subclause 6.5.4 apply to the UE operating on SUL bands

The normative reference for this requirement is TS 38.101-1 [2] clause 6.5.4.

6.5C.4.4 Test description

Same test description as specified in clause 6.2.4.4 with following exceptions:

- Instead of Table 5.3.5-1 🡪 use Table 5.5C-1

- Instead of Table 6.5.4.4.1-1🡪 use Table 6.5C.4.4-1

Table 6.5C.4.4-1: Test Configuration Table

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Initial Conditions | | | | | |
| Test Environment as specified in TS 38.508-1 [5] subclause 4.1 | | | Normal | | |
| Test Frequencies as specified in TS 38.508-1 [5] subclause 4.3.1 | | | Mid range for both SUL carrier and Non-SUL carrier | | |
| Test Channel Bandwidths as specified in TS 38.508-1 [5] subclause 4.3.1 | | | Mid, Highest for SUL carrier  Lowest for Non-SUL carrier | | |
| Test SCS as specified in Table 5.3.5-1 | | | 15kHz for SUL carrier and Lowest supported SCS for Non-SUL carrier | | |
| Test Parameters for Channel Bandwidths | | | | | |
| Test ID | Downlink Configuration | UL Configuration | | SUL Configuration | |
|  | N/A | N/A | | Modulation | RB allocation (NOTE 2) |
| 1 |  |  | | DFT-s-OFDM Pi/2 BPSK | Inner Full |
| 2 |  |  | | DFT-s-OFDM QPSK | Inner Full |
| NOTE 1: Test Channel Bandwidths are checked separately for each SUL band combination, the applicable channel bandwidths are specified in Table 5.5C-1.  NOTE 2: The specific configuration of each RB allocation is defined in Table 6.1-1.  NOTE 3: DFT-s-OFDM PI/2 BPSK test applies only for UEs which supports half Pi BPSK in FR1.  NOTE 4: For NR band n83, 30MHz test channel bandwidth is tested with Low range test frequency. | | | | | |

- Connect the SS to the UE antenna connectors as shown in TS 38.508-1 [5] Annex A, Figure A.3.1.3.4 for TE diagram and section A.3.2 for UE diagram.

- The parameter setting for the cell are set up according to the TS 38.508-1 [5] subclause 4.4.3

- Downlink signals are initially setup according to Annex C.0, C.1, C.2 and uplink signals according to Annex G.0, G.1, G.2, and G.3.0 with consideration of supplementary uplink physical channels.

- Instead of Table 6.5.4.5-1🡪 use Table 6.5C.4.5-1

- Message contents in initial conditions are according to TS 38.508-1 [5] subclause 4.3.6.1.1.2 ensuring UL/SUL indicator in Table 4.3.6.1.1.2-1 with condition SUL, subclause 4.6 ensuring Tables 4.6.1-28 with condition SUL AND (RF OR RRM), 4.6.3-14 with condition SUL\_SUL for SUL carrier, and Table 4.6.3-167 with condition PUSCH\_PUCCH\_ON\_SUL.

6.5C.4.5 Test requirement

The ratio derived in step 6 and 8, shall not exceed the described value in Table 6.5C.4.5-1.

Table 6.5C.4.5-1: Transmit Intermodulation

|  |  |  |
| --- | --- | --- |
| Wanted signal  channel bandwidth | BWChannel | |
| Interference signal  frequency offset from channel centre | BWChannel | 2\*BWChannel |
| Interference CW signal level | -40dBc | |
| Intermodulation product | < -29dBc | < -35dBc |
| Measurement bandwidth | The maximum transmission bandwidth configuration among the different SCSs for the channel BW as defined in Table 6.5.2.4.1.3-1 | |
| Measurement offset from channel centre | BWChannel and 2\*BWChannel | 2\*BWChannel and 4\*BWChannel |

## 6.5D Output RF spectrum emissions for UL MIMO

### 6.5D.1 Occupied bandwidth for UL MIMO

6.5D.1.1 Test purpose

To verify that the UE occupied bandwidth for all transmission bandwidth configurations supported by the UE supporting UL MIMO are less than their specific limits when UE is configured using UL MIMO transmission.

6.5D.1.2 Test applicability

This test applies to all types of NR Power Class 1.5, Power Class 2 and Power Class 3 UE release 15 and forward that support 2-layer codebook based UL MIMO.

6.5D.1.3 Minimum conformance requirements

For UE supporting UL MIMO, the requirements for occupied bandwidth apply to the sum of the powers from both UE transmit antenna connectors. The occupied bandwidth is defined as the bandwidth containing 99 % of the total integrated mean power of the transmitted spectrum on the assigned channel at each transmit antenna connector.

For UE with two transmit antenna connectors in closed-loop spatial multiplexing scheme, the occupied bandwidth at each transmitter antenna shall be less than the channel bandwidth specified in table 6.5.1.3-1. The requirements shall be met with UL MIMO configurations described in sub-clause 6.2D.1.3.

If UE is configured for transmission on single-antenna port by DCI format 0\_0 or by DCI format 0\_1 for single antenna port codebook based transmission, the requirements in subclause 6.5.1.3 apply

The normative reference for this requirement is TS 38.101-1 [2] clause 6.5D.1.

6.5D.1.4 Test description

6.5D.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, test channel bandwidths and sub-carrier spacing based on NR operating bands specified in table 5.3.5-1. All of these configurations shall be tested with applicable test parameters for each combination of channel bandwidth and sub-carrier spacing, are shown in table 6.5D.1.4.1-1. The details of the uplink reference measurement channels (RMCs) are specified in Annexes A.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Table 6.5D.1.4.1-1: Test Configuration Table

|  |  |  |  |
| --- | --- | --- | --- |
| Initial Conditions | | | |
| Test Environment as specified in TS 38.508-1 [5] subclause 4.1 | | Normal | |
| Test Frequencies as specified in TS 38.508-1 [5] subclause 4.3.1 | | Mid range by default, exceptions listed in Table 6.5D.1.4.1-2 | |
| Test Channel Bandwidths as specified in TS 38.508-1 [5] subclause 4.3.1 | | All | |
| Test SCS as specified in Table 5.3.5-1 | | Lowest SCS | |
| Test Parameters | | | |
| Test ID | Downlink Configuration | Uplink Configuration | |
|  | N/A for occupied bandwidth test case | Modulation | RB allocation (NOTE 1) |
| 1 | CP-OFDM QPSK | Outer\_full |
| NOTE 1: The specific configuration of each RB allocation is defined in Table 6.1-1. | | | |

Table 6.5D.1.4.1-2: Test frequency exceptions for Occupied Bandwidth

|  |  |
| --- | --- |
| 5G NR Band | Test Frequency |
| n77 | Low Range, Mid Range, High Range |
| n78 | Low Range, Mid Range, High Range |
| n79 | Low Range, Mid Range, High Range |

1. Connect the SS to the UE antenna connectors as shown in TS 38.508-1 [5] Annex A, Figure A.3.1.1.2 for TE diagram and section A.3.2 for UE diagram.

2. The parameter settings for the cell are set up according to TS 38.508-1 [5] subclause 4.4.3.

3. Downlink signals are initially set up according to Annex C.0, C.1, C.2, and uplink signals according to Annex G.0, G.1, G.2, G.3.0.

4. The UL Reference Measurement channels are set according to Table 6.5D.1.4.1-1.

5. Propagation conditions are set according to Annex B.0.

6. Ensure the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On,* Test Mode *On* and Test Loop Function *On* according to TS 38.508-1 [5] clause 4.5. Message contents are defined in clause 6.5D.1.4.3

6.5D.1.4.2 Test procedure

1. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0\_1 for C\_RNTI to schedule the UL RMC according to Table 6.5D.1.4.1-1. Since the UL has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC. The PDCCH DCI format 0\_1 is specified with condition 2TX\_UL\_MIMO in 38.508-1 [5] subclause 4.3.6.1.1.2

2. Send continuously power control “up” commands to the UE until the UE transmits at PUMAX level. Allow at least 200ms for the UE to reach PUMAX level.

3. Measure the power spectrum distribution as the sum of the powers from both UE transmit antenna connectors within two times or more range over the requirement for Occupied Bandwidth specification centring on the current carrier frequency. The characteristics of the filter shall be approximately Gaussian (typical spectrum analyser filter). Other methods to measure the power spectrum distribution are allowed. The measuring duration is 1ms over consecutive active uplink slots. For TDD, only slots consisting of only UL symbols are under test.

4. Calculate the total power within the range of all frequencies measured in step 3 and save this value as “Total power”.

5. Sum up the power upward from the lower boundary of the measured frequency range in step 3 and seek the limit frequency point by which this sum becomes 0.5% of “Total power” and save this point as “Lower Frequency”.

6. Sum up the power downward from the upper boundary of the measured frequency range in step 3 and seek the limit frequency point by which this sum becomes 0.5% of “Total power” and save this point as “Upper Frequency”.

7. Calculate the difference “Upper Frequency” – “Lower Frequency” = “Occupied Bandwidth” between the two limit frequencies obtained in step 5 and step 6.

6.5D.1.4.3 Message contents

Message contents are according to TS 38.508-1 [5] subclause 4.6 ensuring Table 4.6.3-182 with condition 2TX\_UL\_MIMO

6.5D.1.5 Test requirement

The measured Occupied Bandwidth in step 7 shall not exceed values in Table 6.5D.1.5-1.

Table 6.5D.1.5-1: Occupied channel bandwidth

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | NR channel bandwidth | | | | | | | | | | | | | | |
|  | 5  MHz | 10 MHz | 15 MHz | 20 MHz | 25 MHz | 30 MHz | 35  MHz | 40 MHz | 45 MHz | 50 MHz | 60 MHz | 70 MHz | 80 MHz | 90 MHz | 100 MHz |
| Occupied channel bandwidth (MHz) | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 | 60 | 70 | 80 | 90 | 100 |

### 6.5D.1\_1 Void

### 6.5D.1\_2 Occupied bandwidth for SUL with UL MIMO

6.5D.1\_2.1 Test purpose

Same as test purpose in clause 6.5D.1.1.

6.5D.1\_2.2 Test applicability

This test applies to all types of NR UE release 17 and forward that support SUL and UL MIMO operating on the SUL bands.

6.5D.1\_2.3 Minimum conformance requirements

For UE supporting UL MIMO, the requirements for occupied bandwidth apply to the sum of the powers from both UE transmit antenna connectors. The occupied bandwidth is defined as the bandwidth containing 99 % of the total integrated mean power of the transmitted spectrum on the assigned channel at each transmit antenna connector.

For UE with two transmit antenna connectors in closed-loop spatial multiplexing scheme, the occupied bandwidth shall be less than the channel bandwidth specified in table 6.5.1.3-1. The requirements shall be met with UL MIMO configurations described in clause 6.2D.1\_1.3.

If UE is scheduled for single antenna-port PUSCH transmission by DCI format 0\_0 or by DCI format 0\_1 for single antenna port codebook-based transmission, the requirements in clause 6.5.1 apply.

The normative reference for this requirement is TS 38.101-1 [2] clause 6.5D.1.

6.5D.1\_2.4 Test description

6.5D.1\_2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, test channel bandwidths and sub-carrier spacing based on NR operating bands specified in table 5.3.5-1. All of these configurations shall be tested with applicable test parameters for each combination of channel bandwidth and sub-carrier spacing, are shown in table 6.5D.1\_2.4.1-1. The details of the uplink reference measurement channels (RMCs) are specified in Annexes A.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Table 6.5D.1\_2.4.1-1: Test Configuration Table

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Initial Conditions | | | | | |
| Test Environment as specified in TS 38.508-1 [5] subclause 4.1 | | | Normal | | |
| Test Frequencies as specified in TS 38.508-1 [5] subclause 4.3.1 | | | Mid Range for SUL carrier  Mid Range for Non-SUL carrier | | |
| Test Channel Bandwidths as specified in TS 38.508-1 [5] subclause 4.3.1 | | | All for SUL carrier  Lowest for Non-SUL carrier | | |
| Test SCS as specified in Table 5.3.5-1 | | | 15kHz for SUL carrier and Lowest supported SCS for Non-SUL carrier | | |
| Test Parameters for Channel Bandwidths | | | | | |
|  | Downlink Configuration | UL Configuration | | SUL Configuration | |
| Test ID | N/A | N/A | | Modulation | RB allocation |
| 1 |  |  | | CP-OFDM QPSK | Outer\_full |
| Note 1: Test Channel Bandwidths are checked separately for each SUL band combination, the applicable channel bandwidths are specified in Table 5.5C-1.  Note 2: The specific configuration of each RB allocation is defined in Table 6.1-1. | | | | | |

1. Connect the SS to the UE antenna connectors as shown in TS 38.508-1 [5] Annex A, Figure A.3.1.1.5 for TE diagram and section A.3.2 for UE diagram.

2. The parameter settings for the cell are set up according to TS 38.508-1 [5] subclause 4.4.3.

3. Downlink signals are initially set up according to Annex C.0, C.1, C.2, and uplink signals according to Annex G.0, G.1, G.2, G.3.0.

4. The UL and DL Reference Measurement channels are set according to Table 6.5D.1\_2.4.1-1

5. Propagation conditions are set according to Annex B.0.

6. Ensure the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity *NR,* Connected without release *On,* Test Mode *On* and Test Loop Function *On* according to TS 38.508-1 [5] clause 4.5. Message contents are defined in clause 6.3D.4.3.4.3.

6.5D.1\_2.4.2 Test procedure

1. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0\_1 for C\_RNTI to schedule the UL RMC according to Table 6.5D.1\_2.4.1-1. Since the UL has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC. The PDCCH DCI format 0\_1 is specified with condition 2TX\_UL\_MIMO in 38.508-1 [5] subclause 4.3.6.1.1.2

2. Send continuously power control “up” commands to the UE until the UE transmits at PUMAX level. Allow at least 200ms for the UE to reach PUMAX level.

3. Measure the power spectrum distribution as the sum of the powers from both UE transmit antenna connectors within two times or more range over the requirement for Occupied Bandwidth specification centring on the current carrier frequency. The characteristics of the filter shall be approximately Gaussian (typical spectrum analyser filter). Other methods to measure the power spectrum distribution are allowed. The measuring duration is 1ms over consecutive active uplink slots. For TDD, only slots consisting of only UL symbols are under test.

4. Calculate the total power within the range of all frequencies measured in step 3 and save this value as “Total power”.

5. Sum up the power upward from the lower boundary of the measured frequency range in step 3 and seek the limit frequency point by which this sum becomes 0.5% of “Total power” and save this point as “Lower Frequency”.

6. Sum up the power downward from the upper boundary of the measured frequency range in step 3 and seek the limit frequency point by which this sum becomes 0.5% of “Total power” and save this point as “Upper Frequency”.

7. Calculate the difference “Upper Frequency” – “Lower Frequency” = “Occupied Bandwidth” between the two limit frequencies obtained in step 5 and step 6.

6.5D.1\_2.4.3 Message contents

Message contents are according to TS 38.508-1 [5] subclause 4.3.6.1.1.2 ensuring UL/SUL indicator in Table 4.3.6.1.1.2-1 with condition SUL, subclause 4.6 ensuring Table 4.6.1-28 with condition SUL AND (RF OR RRM), Tables 4.6.3-14 with condition SUL\_SUL for SUL carrier, Table 4.6.3-167 with condition PUSCH\_PUCCH\_ON\_SUL, and Table 4.6.3-182 with the condition 2TX\_UL\_MIMO.

6.5D.1\_2.5 Test requirement

The measured Occupied Bandwidth in step 7 shall not exceed values in Table 6.5D.1\_2.5-1.

Table 6.5D.1\_2.5-1: Occupied channel bandwidth

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | NR channel bandwidth | | | | | | | | |
|  | 5 MHz | 10 MHz | 15 MHz | 20 MHz | 25 MHz | 30 MHz | 40 MHz | 45 MHz | 50 MHz |
| Occupied channel bandwidth (MHz) | 5 | 10 | 15 | 20 | 25 | 30 | 40 | 45 | 50 |

### 6.5D.2 Out of band emission for UL MIMO

#### 6.5D.2.1 General

For UE supporting UL MIMO, the requirements for Out of band emissions resulting from the modulation process and non-linearity in the transmitters are specified as the sum of the emissions from both UE transmit antenna connectors.

For UEs with two transmit antenna connectors in closed-loop spatial multiplexing scheme, the requirements in subclause 6.5.2 apply. The requirements shall be met with UL MIMO configurations described in sub-clause 6.2D.1.3

If UE is scheduled for single antenna-port PUSCH transmission by DCI format 0\_0 or by DCI format 0\_1 for single antenna port codebook-based transmission, the requirements in subclause 6.5.2 apply.

#### 6.5D.2.2 Spectrum emission mask for UL MIMO

6.5D.2.2.1 Test purpose

To verify that the power of any UE emission shall not exceed specified level for the specified channel bandwidth.

6.5D.2.2.2 Test applicability

This test case applies to all types of NR Power Class 1.5, Power Class 2 and Power Class 3 UE release 15 and forward that supports 2-layer codebook based UL MIMO.

This test case applies to all types of NR Power Class 1.5, Power Class 2 and Power Class 3 UE release 16 and forward that support UL full power transmission (ULFPTx).

6.5D.2.2.3 Minimum conformance requirements

The sum of power of any UE emission shall not exceed the levels specified in Table 6.5.2.2.3-1 for the specified channel bandwidth from both transmit antenna connectors.

For UE support uplink full power transmission (ULFPTx) for UL MIMO, the requirements in clause 6.5.2.2 shall apply. The requirements shall be met with the PUSCH configurations specified in Table 6.2D.1.3-3, based upon UE’s support of uplink full power transmission mode.

If UE is scheduled for single antenna-port PUSCH transmission by DCI format 0\_0 or by DCI format 0\_1 for single antenna port codebook based transmission, the requirements in clause 6.5.2.2 apply.

The normative reference for this requirement is TS 38.101-1 [2] clause 6.5D.2 and 6.5.2.2

6.5D.2.2.4 Test description

6.5D.2.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, test channel bandwidths and sub-carrier spacing based on NR operating bands specified in table 5.3.5-1. All of these configurations shall be tested with applicable test parameters for each combination of channel bandwidth and sub-carrier spacing, and are shown in tables 6.5D.2.2.4.1-1 to 6.5D.2.2.4.1-3. The details of the uplink reference measurement channels (RMCs) are specified in Annexes A.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2

Table 6.5D.2.2.4.1-1: Test Configuration Table for power class 3, power class 2 and power class 1.5

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Default Conditions | | | | | | |
| Test Environment as specified in TS 38.508-1 [5] subclause 4.1 | | | | | Normal | |
| Test Frequencies as specified in TS 38.508-1 [5] subclause 4.3.1 | | | | | Low range, High range | |
| Test Channel Bandwidths as specified in TS 38.508-1 [5] subclause 4.3.1 | | | | | Lowest, Highest | |
| Test SCS as specified in Table 5.3.5-1 | | | | | Lowest and Highest | |
| Test Parameters for Channel Bandwidths | | | | | | |
| Test ID | Freq | ChBw | SCS | Downlink Configuration | Uplink Configuration | |
|  |  | Default | Default | N/A for Spectrum Emission Mask test case | Modulation | RB allocation (NOTE 1) |
| 1 | Low |  |  | CP-OFDM QPSK | Edge\_1RB\_Left |
| 2 | High |  |  | CP-OFDM QPSK | Edge\_1RB\_Right |
| 3 | Default |  |  | CP-OFDM QPSK | Outer\_Full |
| 4 | Low |  |  | CP-OFDM 16 QAM | Edge\_1RB\_Left |
| 5 | High |  |  | CP-OFDM 16 QAM | Edge\_1RB\_Right |
| 6 | Default |  |  | CP-OFDM 16 QAM | Outer\_Full |
| 7 | Low |  |  | CP-OFDM 64 QAM | Edge\_1RB\_Left |
| 8 | High |  |  | CP-OFDM 64 QAM | Edge\_1RB\_Right |
| 9 | Default |  |  | CP-OFDM 64 QAM | Outer\_Full |
| 10 | Low |  |  | CP-OFDM 256 QAM | Edge\_1RB\_Left |
| 11 | High |  |  | CP-OFDM 256 QAM | Edge\_1RB\_Right |
| 12 | Default |  |  | CP-OFDM 256 QAM | Outer\_Full |
| NOTE 1: The specific configuration of each RF allocation is defined in Table 6.1-1. | | | | | | |

Table 6.5D.2.2.4.1-2: Test Configuration Table for power class 3 with supporting ULFPTx

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Initial Conditions | | | | |
| Test Environment as specified in TS 38.508-1 [5] subclause 4.1 | | | Normal | |
| Test Frequencies as specified in TS 38.508-1 [5] subclause 4.3.1 | | | Low range, High range | |
| Test Channel Bandwidths as specified in TS 38.508-1 [5] subclause 4.3.1 | | | Lowest, Highest | |
| Test SCS as specified in Table 5.3.5-1 | | | Lowest, Highest | |
| Test Parameters for Channel Bandwidths | | | | |
| Test ID | Freq | Downlink Configuration | Uplink Configuration | |
|  |  | N/A for Maximum Power Reduction (MPR) test case | Modulation (NOTE 2) | RB allocation (NOTE 1) |
| 14 | Low |  | DFT-s-OFDM Pi/2 BPSK | Edge\_1RB\_Left |
| 24 | High |  | DFT-s-OFDM Pi/2 BPSK | Edge\_1RB\_Right |
| 34 | Default |  | DFT-s-OFDM Pi/2 BPSK | Outer Full |
| 44 | Low |  | DFT-s-OFDM QPSK | Edge\_1RB\_Left |
| 5 | High |  | DFT-s-OFDM QPSK | Edge\_1RB\_Right |
| 6 | Default |  | DFT-s-OFDM QPSK | Outer Full |
| 7 | Low |  | DFT-s-OFDM 16 QAM | Edge\_1RB\_Left |
| 8 | High |  | DFT-s-OFDM 16 QAM | Edge\_1RB\_Right |
| 9 | Default |  | DFT-s-OFDM 16 QAM | Outer Full |
| 10 | Low |  | DFT-s-OFDM 64 QAM | Edge\_1RB\_Left |
| 11 | High |  | DFT-s-OFDM 64 QAM | Edge\_1RB\_Right |
| 12 | Default |  | DFT-s-OFDM 64 QAM | Outer Full |
| 13 | Low |  | DFT-s-OFDM 256 QAM | Edge\_1RB\_Left |
| 14 | High |  | DFT-s-OFDM 256 QAM | Edge\_1RB\_Right |
| 15 | Default |  | DFT-s-OFDM 256 QAM | Outer Full |
| 16 | Low |  | CP-OFDM QPSK | Edge\_1RB\_Left |
| 17 | High |  | CP-OFDM QPSK | Edge\_1RB\_Right |
| 18 | Default |  | CP-OFDM QPSK | Outer Full |
| 19 | Low |  | CP-OFDM 16 QAM | Edge\_1RB\_Left |
| 20 | High |  | CP-OFDM 16 QAM | Edge\_1RB\_Right |
| 21 | Default |  | CP-OFDM 16 QAM | Outer Full |
| 22 | Low |  | CP-OFDM 64 QAM | Edge\_1RB\_Left |
| 23 | High |  | CP-OFDM 64 QAM | Edge\_1RB\_Right |
| 24 | Default |  | CP-OFDM 64 QAM | Outer Full |
| 25 | Low |  | CP-OFDM 256 QAM | Edge\_1RB\_Left |
| 26 | High |  | CP-OFDM 256 QAM | Edge\_1RB\_Right |
| 27 | Default |  | CP-OFDM 256 QAM | Outer Full |
| NOTE 1: The specific configuration of each RB allocation is defined in Table 6.1-1.  NOTE 2: DFT-s-OFDM Pi/2 BPSK test applies only for UEs which supports half Pi BPSK in FR1.  NOTE 3: Test ID 16 ~ 27 with CP-OFDM modulation are not needed if PDCCH DCI format 0\_1 indicates ULFPTx\_Mode1.  NOTE 4: UE operating in FDD mode, or in TDD mode in bands other than n40, n41, n77, n78 and n79, or in TDD mode the IE *powerBoostPi2BPSK* is set to 0 for bands n40, n41, n77, n78 and n79. | | | | |

Table 6.5D.2.2.4.1-3: Test Configuration Table for power class 2 with supporting ULFPTx

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Initial Conditions | | | | |
| Test Environment as specified in TS 38.508-1 [5] subclause 4.1 | | | Normal | |
| Test Frequencies as specified in TS 38.508-1 [5] subclause 4.3.1 | | | Low range, High range | |
| Test Channel Bandwidths as specified in TS 38.508-1 [5] subclause 4.3.1 | | | Lowest, Highest | |
| Test SCS as specified in Table 5.3.5-1 | | | Lowest, Highest | |
| Test Parameters for Channel Bandwidths | | | | |
| Test ID | Freq | Downlink Configuration | Uplink Configuration | |
|  |  | N/A for Maximum Power Reduction (MPR) test case | Modulation (NOTE 2) | RB allocation (NOTE 1) |
| 1 | Low |  | DFT-s-OFDM Pi/2 BPSK | Edge\_1RB\_Left |
| 2 | High |  | DFT-s-OFDM Pi/2 BPSK | Edge\_1RB\_Right |
| 3 | Default |  | DFT-s-OFDM Pi/2 BPSK | Outer Full |
| 4 | Low |  | DFT-s-OFDM QPSK | Edge\_1RB\_Left |
| 5 | High |  | DFT-s-OFDM QPSK | Edge\_1RB\_Right |
| 6 | Default |  | DFT-s-OFDM QPSK | Outer Full |
| 7 | Low |  | DFT-s-OFDM 16 QAM | Edge\_1RB\_Left |
| 8 | High |  | DFT-s-OFDM 16 QAM | Edge\_1RB\_Right |
| 9 | Default |  | DFT-s-OFDM 16 QAM | Outer Full |
| 10 | Low |  | DFT-s-OFDM 64 QAM | Edge\_1RB\_Left |
| 11 | High |  | DFT-s-OFDM 64 QAM | Edge\_1RB\_Right |
| 12 | Default |  | DFT-s-OFDM 64 QAM | Outer Full |
| 13 | Low |  | DFT-s-OFDM 256 QAM | Edge\_1RB\_Left |
| 14 | High |  | DFT-s-OFDM 256 QAM | Edge\_1RB\_Right |
| 15 | Default |  | DFT-s-OFDM 256 QAM | Outer Full |
| 16 | Low |  | CP-OFDM QPSK | Edge\_1RB\_Left |
| 17 | High |  | CP-OFDM QPSK | Edge\_1RB\_Right |
| 18 | Default |  | CP-OFDM QPSK | Outer Full |
| 19 | Low |  | CP-OFDM 16 QAM | Edge\_1RB\_Left |
| 20 | High |  | CP-OFDM 16 QAM | Edge\_1RB\_Right |
| 21 | Default |  | CP-OFDM 16 QAM | Outer Full |
| 22 | Low |  | CP-OFDM 64 QAM | Edge\_1RB\_Left |
| 23 | High |  | CP-OFDM 64 QAM | Edge\_1RB\_Right |
| 24 | Default |  | CP-OFDM 64 QAM | Outer Full |
| 25 | Low |  | CP-OFDM 256 QAM | Edge\_1RB\_Left |
| 26 | High |  | CP-OFDM 256 QAM | Edge\_1RB\_Right |
| 27 | Default |  | CP-OFDM 256 QAM | Outer Full |
| NOTE 1: The specific configuration of each RB allocation is defined in Table 6.1-1.  NOTE 2: DFT-s-OFDM Pi/2 BPSK test applies only for UEs which supports half Pi BPSK in FR1.  NOTE 3: Test ID 16 ~ 27 with CP-OFDM modulation are not needed if PDCCH DCI format 0\_1 indicates ULFPTx\_Mode1. | | | | |

Table 6.5D.2.2.4.1-4: Test Configuration Table for power class 1.5 UEs supporting ULFPTx except the feature *ul-FullPwrMode-r16* or *ul-FullPwrMode2-TPMIGroup-r16*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Initial Conditions | | | | |
| Test Environment as specified in TS 38.508-1 [5] subclause 4.1 | | | Normal | |
| Test Frequencies as specified in TS 38.508-1 [5] subclause 4.3.1 | | | Low range, High range | |
| Test Channel Bandwidths as specified in TS 38.508-1 [5] subclause 4.3.1 | | | Lowest, Highest | |
| Test SCS as specified in Table 5.3.5-1 | | | Lowest, Highest | |
| Test Parameters for Channel Bandwidths | | | | |
| Test ID | Freq | Downlink Configuration | Uplink Configuration | |
|  |  | N/A for Maximum Power | Modulation (NOTE 2) | RB allocation (NOTE 1) |
| 1 | Low |  | DFT-s-OFDM Pi/2 BPSK | Edge\_1RB\_Left |
| 2 | High |  | DFT-s-OFDM Pi/2 BPSK | Edge\_1RB\_Right |
| 3 | Default |  | DFT-s-OFDM Pi/2 BPSK | Outer Full |
| 4 | Low |  | DFT-s-OFDM QPSK | Edge\_1RB\_Left |
| 5 | High |  | DFT-s-OFDM QPSK | Edge\_1RB\_Right |
| 6 | Default |  | DFT-s-OFDM QPSK | Outer Full |
| 7 | Low |  | DFT-s-OFDM 16 QAM | Edge\_1RB\_Left |
| 8 | High |  | DFT-s-OFDM 16 QAM | Edge\_1RB\_Right |
| 9 | Default |  | DFT-s-OFDM 16 QAM | Outer Full |
| 10 | Low |  | DFT-s-OFDM 64 QAM | Edge\_1RB\_Left |
| 11 | High |  | DFT-s-OFDM 64 QAM | Edge\_1RB\_Right |
| 12 | Default |  | DFT-s-OFDM 64 QAM | Outer Full |
| 13 | Low |  | DFT-s-OFDM 256 QAM | Edge\_1RB\_Left |
| 14 | High |  | DFT-s-OFDM 256 QAM | Edge\_1RB\_Right |
| 15 | Default |  | DFT-s-OFDM 256 QAM | Outer Full |
| 16 | Low |  | CP-OFDM QPSK | Edge\_1RB\_Left |
| 17 | High |  | CP-OFDM QPSK | Edge\_1RB\_Right |
| 18 | Default |  | CP-OFDM QPSK | Outer Full |
| 19 | Low |  | CP-OFDM 16 QAM | Edge\_1RB\_Left |
| 20 | High |  | CP-OFDM 16 QAM | Edge\_1RB\_Right |
| 21 | Default |  | CP-OFDM 16 QAM | Outer Full |
| 22 | Low |  | CP-OFDM 64 QAM | Edge\_1RB\_Left |
| 23 | High |  | CP-OFDM 64 QAM | Edge\_1RB\_Right |
| 24 | Default |  | CP-OFDM 64 QAM | Outer Full |
| 25 | Low |  | CP-OFDM 256 QAM | Edge\_1RB\_Left |
| 26 | High |  | CP-OFDM 256 QAM | Edge\_1RB\_Right |
| 27 | Default |  | CP-OFDM 256 QAM | Outer Full |
| NOTE 1: The specific configuration of each RB allocation is defined in Table 6.1-1.  NOTE 2: DFT-s-OFDM Pi/2 BPSK test applies only for UEs which supports half Pi BPSK in FR1.  NOTE 3: Test ID 16 ~ 27 with CP-OFDM modulation are not needed if PDCCH DCI format 0\_1 indicates ULFPTx\_Mode1. | | | | |

1. Connect the SS to the UE antenna connectors as shown in TS 38.508-1 [5] Annex A, Figure A.3.1.1.2 for TE diagram and section A.3.2 for UE diagram.

2. The parameter settings for the cell are set up according to TS 38.508-1 [5] subclause 4.4.3.

3. Downlink signals are initially set up according to Annex C.0, C.1, C.2, and uplink signals according to Annex G.0, G.1, G.2, G.3.0.

4. The UL Reference Measurement channels are set according to tables 6.5D.2.2.4.1-1 to 6.5D.2.2.4.1-3.

5. Propagation conditions are set according to Annex B.0.

6. Ensure the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On,* Test Mode *On* and Test Loop Function *On* according to TS 38.508-1 [5] clause 4.5. Message contents are defined in clause 6.5D.2.2.4.3

6.5D.2.2.4.2 Test procedure

1. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0\_1 for C\_RNTI to schedule the UL RMC according to Table 6.5D.2.2.4.1-1. Since the UL has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC. The PDCCH DCI format 0\_1 is specified with condition 2TX\_UL\_MIMO in 38.508-1 [5] subclause 4.3.6.1.1.2

2. Send continuously power control “up” commands to the UE until the UE transmits at PUMAX level. Allow at least 200ms for the UE to reach PUMAX level.

3. Measure the sum of the mean power of the UE in the channel bandwidth of the radio access mode according to the test configuration, which shall meet the requirements described in Tables 6.2D.2.5-1 or 6.2D.2.5-2 as appropriate. The period of the measurement shall be at least the continuous duration of 1ms over consecutive active uplink slots and uplink symbols. For TDD, only slots consisting of only UL symbols are under test.

4. Measure the sum of power of the transmitted signal from both antenna connectors with a measurement filter of bandwidths according to Table 6.5D.2.2.5-1 and using a rms detector. If the sweep count is higher than one, the trace mode shall be average. The centre frequency of the filter shall be stepped in continuous steps according to the same table. The measured power shall be recorded for each step. The measurement period shall capture the active TSs.

5. If UE supports ULFPTx, repeat test steps 1~3 with UL RMC according to Table 6.5D.2.2.4.1-2 through Table 6.5D.2.2.4.1-4 as appropriate. The PDCCH DCI format 0\_1 is specified with the condition ULFPTx\_Mode1, ULFPTx\_Mode2 or ULFPTx\_ModeFull in 38.508-1 [5] subclause 4.3.6.1.1.2 depending on UE reported capability. Message contents are according to TS 38.508-1 [5] clause 4.6.3 Table 4.6.3-118 with condition TRANSFORM\_PRECODER\_ENABLED.

NOTE 1: When switching to DFT-s-OFDM waveform, as specified in the test configuration Table 6.5D.2.2.4.1-2, send an NR RRCReconfiguration message according to TS 38.508-1 [5] clause 4.6.3 Table 4.6.3-118 PUSCH-Config with TRANSFORM\_PRECODER\_ENABLED condition.

6.5D.2.2.4.3 Message contents

Message contents are according to TS 38.508-1 [5] subclause 4.6 and 5.4 ensuring Table 4.6.3-182 with condition 2TX\_UL\_MIMO.

6.5D.2.2.5 Test requirement

The measured sum of the UE mean power in the channel bandwidth, derived in step 3, shall fulfil requirements in clause 6.2D.2.5 as appropriate, and the sum of power of any UE emission measured from both antennas in step 4 and step 5 shall fulfill requirements in Table 6.5D.2.2.5-1.

Table 6.5D.2.2.5-1: NR General spectrum emission mask

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **ΔfOOB  (MHz)** | **Channel bandwidth (MHz) / Spectrum emission limit (dBm)** | | | **Measurement bandwidth** |
| **5** | **10, 15, 20, 25, 30, 35, 40, 45** | **50, 60, 70, 80, 90, 100** |
| ± 0-1 | -13 + TT | -13 + TT |  | 1 % of channel BW |
| ± 0-1 |  |  | -24 + TT | 30 kHz |
| ± 1-5 | -10 + TT | -10 + TT | | 1 MHz |
| ± 5-6 | -13 + TT |  | |
| ± 6-10 | -25 + TT |  | |
| ± 5-BWChannel |  | -13 + TT | |
| ± BWChannel-(BWChannel+5) |  | -25 + TT | |
| Note 1: The first and last measurement position with a 30 kHz filter is at ΔfOOB equals to 0.015 MHz and 0.985 MHz.  Note 2: At the boundary of spectrum emission limit, the first and last measurement position with a 1 MHz filter is the inside of +0.5MHz and -0.5MHz, respectively.  Note 3: The measurements are to be performed above the upper edge of the channel and below the lower edge of the channel.  Note 4: TT for each frequency and channel bandwidth is specified in Table 6.5D.2.2.5-2. | | | | |

Table 6.5D.2.2.5-2: Test Tolerance (Spectrum Emission Mask)

|  |  |  |  |
| --- | --- | --- | --- |
|  | **f ≤ 3.0GHz** | **3.0GHz < f ≤ 4.2GHz** | **4.2GHz < f ≤ 6.0GHz** |
| BW ≤ 100MHz | 1.5 dB | 1.8 dB | 1.8 dB |

NOTE: As a general rule, the resolution bandwidth of the measuring equipment should be equal to the measurement bandwidth. However, to improve measurement accuracy, sensitivity and efficiency, the resolution bandwidth may be smaller than the measurement bandwidth. When the resolution bandwidth is smaller than the measurement bandwidth, the result should be integrated over the measurement bandwidth in order to obtain the equivalent noise bandwidth of the measurement bandwidth.

#### 6.5D.2.2\_1 Spectrum emission mask for SUL with UL MIMO

6.5D.2.2\_1.1 Test purpose

Same as test purpose in clause 6.5D.2.2.1.

6.5D.2.2\_1.2 Test applicability

This test applies to all types of NR UE release 17 and forward that support SUL and UL MIMO operating on the SUL bands.

6.5D.2.2\_1.3 Minimum conformance requirements

Same as minimum conformance requirements in clause 6.5D.2.2.3.

6.5D.2.2\_1.4 Test description

6.5D.2.2\_1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, test channel bandwidths and sub-carrier spacing based on NR operating bands specified in table 5.3.5-1. All of these configurations shall be tested with applicable test parameters for each combination of channel bandwidth and sub-carrier spacing and are shown in tables 6.5D.2.2\_1.4.1-1 to 6.5D.2.2\_1.4.1-2. The details of the uplink reference measurement channels (RMCs) are specified in Annexes A.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2

Table 6.5D.2.2\_1.4.1-1: Test Configuration Table for power class 3 and power class 2

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Initial Conditions | | | | | | |
| Test Environment as specified in TS 38.508-1 [5] subclause 4.1 | | | | | Normal | |
| Test Frequencies as specified in TS 38.508-1 [5] subclause 4.3.1 | | | | | Low range, High range for SUL carrier  Mid-range for Non-SUL carrier | |
| Test Channel Bandwidths as specified in TS 38.508-1 [5] subclause 4.3.1 | | | | | Lowest, Highest for SUL carrier  Lowest for Non-SUL carrier | |
| Test SCS as specified in Table 5.5C-1 | | | | | 15kHz for SUL carrier and Lowest supported SCS for Non-SUL carrier | |
| Test Parameters for Channel Bandwidths | | | | | | |
| Test ID | Freq | Downlink Configuration | UL Configuration | SUL Configuration | | |
|  |  | N/A | N/A | Modulation | | RB allocation |
| 1 | Low |  |  | CP-OFDM QPSK | | Edge\_1RB\_Left |
| 2 | High |  |  | CP-OFDM QPSK | | Edge\_1RB\_Right |
| 3 | Default |  |  | CP-OFDM QPSK | | Outer\_Full |
| 4 | Low |  |  | CP-OFDM 16 QAM | | Edge\_1RB\_Left |
| 5 | High |  |  | CP-OFDM 16 QAM | | Edge\_1RB\_Right |
| 6 | Default |  |  | CP-OFDM 16 QAM | | Outer\_Full |
| 7 | Low |  |  | CP-OFDM 64 QAM | | Edge\_1RB\_Left |
| 8 | High |  |  | CP-OFDM 64 QAM | | Edge\_1RB\_Right |
| 9 | Default |  |  | CP-OFDM 64 QAM | | Outer\_Full |
| 10 | Low |  |  | CP-OFDM 256 QAM | | Edge\_1RB\_Left |
| 11 | High |  |  | CP-OFDM 256 QAM | | Edge\_1RB\_Right |
| 12 | Default |  |  | CP-OFDM 256 QAM | | Outer\_Full |
| Note 1: Test Channel Bandwidths are checked separately for each SUL band combination, the applicable channel bandwidths are specified in Table 5.5C-1.  Note 2: The specific configuration of each RF allocation is defined in Table 6.1-1. | | | | | | |

Table 6.5D.2.2\_1.4.1-2: Test Configuration Table for UE supporting ULFPTx

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Initial Conditions | | | | | | |
| Test Environment as specified in TS 38.508-1 [5] subclause 4.1 | | | | | Normal | |
| Test Frequencies as specified in TS 38.508-1 [5] subclause 4.3.1 | | | | | Low range, High range for SUL carrier  Mid-range for Non-SUL carrier | |
| Test Channel Bandwidths as specified in TS 38.508-1 [5] subclause 4.3.1 | | | | | Lowest, Highest for SUL carrier  Lowest for Non-SUL carrier | |
| Test SCS as specified in Table 5.5C-1 | | | | | 15kHz for SUL carrier and Lowest supported SCS for Non-SUL carrier | |
| Test Parameters for Channel Bandwidths | | | | | | |
| Test ID | Freq | Downlink Configuration | UL Configuration | SUL Configuration | | |
|  |  | N/A | N/A | Modulation | | RB allocation |
| 15 | Low |  |  | DFT-s-OFDM PI/2 BPSK | | Edge\_1RB\_Left |
| 25 | High |  |  | DFT-s-OFDM PI/2 BPSK | | Edge\_1RB\_Right |
| 35 | Default |  |  | DFT-s-OFDM PI/2 BPSK | | Outer\_Full |
| 45 | Low |  |  | DFT-s-OFDM QPSK | | Edger\_1RB\_Left |
| 5 | High |  |  | DFT-s-OFDM QPSK | | Edge\_1RB\_Right |
| 6 | Default |  |  | DFT-s-OFDM QPSK | | Outer\_Full |
| 7 | Low |  |  | DFT-s-OFDM 16 QAM | | Edge\_1RB\_Left |
| 8 | High |  |  | DFT-s-OFDM 16 QAM | | Edge\_1RB\_Right |
| 9 | Default |  |  | DFT-s-OFDM 16 QAM | | Outer\_Full |
| 10 | Low |  |  | DFT-s-OFDM 64 QAM | | Edge\_1RB\_Left |
| 11 | High |  |  | DFT-s-OFDM 64 QAM | | Edge\_1RB\_Right |
| 12 | Default |  |  | DFT-s-OFDM 64 QAM | | Outer\_Full |
| 13 | Low |  |  | DFT-s-OFDM 256 QAM | | Edge\_1RB\_Left |
| 14 | High |  |  | DFT-s-OFDM 256 QAM | | Edge\_1RB\_Right |
| 15 | Default |  |  | DFT-s-OFDM 256 QAM | | Outer\_Full |
| 16 | Low |  |  | CP-OFDM QPSK | | Edge\_1RB\_Left |
| 17 | High |  |  | CP-OFDM QPSK | | Edge\_1RB\_Right |
| 18 | Default |  |  | CP-OFDM QPSK | | Outer\_Full |
| 19 | Low |  |  | CP-OFDM 16 QAM | | Edge\_1RB\_Left |
| 20 | High |  |  | CP-OFDM 16 QAM | | Edge\_1RB\_Right |
| 21 | Default |  |  | CP-OFDM 16 QAM | | Outer\_Full |
| 22 | Low |  |  | CP-OFDM 64 QAM | | Edge\_1RB\_Left |
| 23 | High |  |  | CP-OFDM 64 QAM | | Edge\_1RB\_Right |
| 24 | Default |  |  | CP-OFDM 64 QAM | | Outer\_Full |
| 25 | Low |  |  | CP-OFDM 256 QAM | | Edge\_1RB\_Left |
| 26 | High |  |  | CP-OFDM 256 QAM | | Edge\_1RB\_Right |
| 27 | Default |  |  | CP-OFDM 256 QAM | | Outer\_Full |
| Note 1: Test Channel Bandwidths are checked separately for each SUL band combination, the applicable channel bandwidths are specified in Table 5.5C-1.  Note 2: The specific configuration of each RF allocation is defined in Table 6.1-1.  Note 3: DFT-s-OFDM PI/2 BPSK test applies only for UEs which supports half Pi BPSK in FR1.  Note 4: Test ID 16 ~ 27 with CP-OFDM modulation are not needed if PDCCH DCI format 0\_1 indicates ULFPTx\_Mode1.  Note 5: For UE indicating PC2, or UE indicating PC3 and operating in FDD mode, or in TDD mode in bands other than n40, n41, n77, n78 and n79, or in TDD mode the IE *powerBoostPi2BPSK* is set to 0 for bands n40, n41, n77, n78 and n79. | | | | | | |

1. Connect the SS to the UE antenna connectors as shown in TS 38.508-1 [5] Annex A, Figure A.3.1.1.5 for TE diagram and section A.3.2 for UE diagram.

2. The parameter settings for the cell are set up according to TS 38.508-1 [5] subclause 4.4.3.

3. Downlink signals are initially set up according to Annex C.0, C.1, C.2, and uplink signals according to Annex G.0, G.1, G.2, G.3.0.

4. The UL and DL Reference Measurement channels are set according to Table 6.5D.2.2\_1.4.1-1 and 6.5D.2.2\_1.4.1-2

5. Propagation conditions are set according to Annex B.0.

6. Ensure the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity *NR,* Connected without release *On,* Test Mode *On* and Test Loop Function *On* according to TS 38.508-1 [5] clause 4.5. Message contents are defined in clause 6.3D.4.3.4.3.

6.5D.2.2\_1.4.2 Test procedure

1. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0\_1 for C\_RNTI to schedule the UL RMC according to Table 6.5D.2.2\_1.4.1-1. Since the UL has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC. The PDCCH DCI format 0\_1 is specified with condition 2TX\_UL\_MIMO in 38.508-1 [5] subclause 4.3.6.1.1.2

2. Send continuously power control “up” commands to the UE until the UE transmits at PUMAX level. Allow at least 200ms for the UE to reach PUMAX level.

3. Measure the sum of the mean power of the UE in the channel bandwidth of the radio access mode according to the test configuration, which shall meet the requirements described in Tables 6.2D.1\_1.5-1. The period of the measurement shall be at least the continuous duration of 1ms over consecutive active uplink slots and uplink symbols. For TDD, only slots consisting of only UL symbols are under test.

4. Measure the sum of power of the transmitted signal from both antenna connectors with a measurement filter of bandwidths according to Table 6.5D.2.2\_1.5-1 and using a rms detector. If the sweep count is higher than one, the trace mode shall be average. The centre frequency of the filter shall be stepped in continuous steps according to the same table. The measured power shall be recorded for each step. The measurement period shall capture the active TSs.

5. If UE supports ULFPTx, repeat test steps 1~3 with UL RMC according to Table 6.5D.2.2\_1.4.1-2. The PDCCH DCI format 0\_1 is specified with the condition ULFPTx\_Mode1, ULFPTx\_Mode2 or ULFPTx\_ModeFull in 38.508-1 [5] subclause 4.3.6.1.1.2 depending on UE reported capability. Message contents are according to TS 38.508-1 [5] clause 4.6.3 Table 4.6.3-118 with condition TRANSFORM\_PRECODER\_ENABLED.

NOTE 1: When switching to DFT-s-OFDM waveform, as specified in the test configuration Table 6.5D.2.2\_1.4.1-2, send an NR RRCReconfiguration message according to TS 38.508-1 [5] clause 4.6.3 Table 4.6.3-118 PUSCH-Config with TRANSFORM\_PRECODER\_ENABLED condition.

6.5D.2.2\_1.4.3 Message contents

Message contents are according to TS 38.508-1 [5] subclause 4.3.6.1.1.2 ensuring UL/SUL indicator in Table 4.3.6.1.1.2-1 with condition SUL, subclause 4.6 ensuring Table 4.6.1-28 with condition SUL AND (RF OR RRM), Tables 4.6.3-14 with condition SUL\_SUL for SUL carrier, Table 4.6.3-167 with condition PUSCH\_PUCCH\_ON\_SUL, and Table 4.6.3-182 with the condition 2TX\_UL\_MIMO.

6.5D.2.2\_1.5 Test requirement

The measured sum of the UE mean power in the channel bandwidth, derived in step 3, shall fulfil requirements in Tables [6.2D.2.5-1, 6.2D.2.5-2, 6.2D.2.5-2a and 6.2D.2.5-2b] as appropriate, and the sum of power of any UE emission measured from both antennas in step 4 and step 5 shall fulfil requirements in Table 6.5D.2.2.5-1.

Table 6.5D.2.2\_1.5-1: NR General spectrum emission mask

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **ΔfOOB  (MHz)** | **Channel bandwidth (MHz) / Spectrum emission limit (dBm)** | | | **Measurement bandwidth** |
| **5** | **10, 15, 20, 25, 30, 40, 45** | **50, 60, 70, 80, 90, 100** |
| ± 0-1 | -13 + TT | -13 + TT |  | 1 % of channel BW |
| ± 0-1 |  |  | -24 + TT | 30 kHz |
| ± 1-5 | -10 + TT | -10 + TT | | 1 MHz |
| ± 5-6 | -13 + TT |  | |
| ± 6-10 | -25 + TT |  | |
| ± 5-BWChannel |  | -13 + TT | |
| ± BWChannel-(BWChannel+5) |  | -25 + TT | |
| Note 1: The first and last measurement position with a 30 kHz filter is at ΔfOOB equals to 0.015 MHz and 0.985 MHz.  Note 2: At the boundary of spectrum emission limit, the first and last measurement position with a 1 MHz filter is the inside of +0.5MHz and -0.5MHz, respectively.  Note 3: The measurements are to be performed above the upper edge of the channel and below the lower edge of the channel.  Note 4: TT for each frequency and channel bandwidth is specified in Table 6.5D.2.2.5-2. | | | | |

Table 6.5D.2.2\_1.5-2: Test Tolerance (Spectrum Emission Mask)

|  |  |  |  |
| --- | --- | --- | --- |
|  | **f ≤ 3.0GHz** | **3.0GHz < f ≤ 4.2GHz** | **4.2GHz < f ≤ 6.0GHz** |
| BW ≤ 100MHz | 1.5 dB | 1.8 dB | 1.8 dB |

NOTE: As a general rule, the resolution bandwidth of the measuring equipment should be equal to the measurement bandwidth. However, to improve measurement accuracy, sensitivity and efficiency, the resolution bandwidth may be smaller than the measurement bandwidth. When the resolution bandwidth is smaller than the measurement bandwidth, the result should be integrated over the measurement bandwidth in order to obtain the equivalent noise bandwidth of the measurement bandwidth.

#### 6.5D.2.3 Additional spectrum emission mask for UL MIMO

Editor’s note:

-Test coverage for the NS\_XXs other than NS\_03, NS\_03U, NS\_04 and NS\_35 is FFS

- Supporting of ULFPTx is only completed for NS\_04 in A-MPR

6.5D.2.3.1 Test purpose

To verify that the sum of power of any UE emission from both transmit antennas shall not exceed specified lever for the specified channel bandwidth under the deployment scenarios where additional requirements are specified.

6.5D.2.3.2 Test applicability

This test case applies to all types of NR Power Class 1.5, Power Class 2 and Power Class 3UE release 15 and forward that supports 2-layer codebook based UL MIMO.

6.5D.2.3.3 Minimum conformance requirements

The sum of power of any UE emission shall not exceed the levels specified in Table 6.5.2.3.3-1 for NS\_35, Table 6.5.2.3.3.2-1 for NS\_04, and Table 6.5.2.3.3.3 for NS\_03 and NS\_03U for the specified channel bandwidth from both transmit antenna connectors.

The normative reference for this requirement is TS 38.101-1 [2] clause 6.5D.2 and 6.5.2.3

6.5D.2.3.4 Test description

6.5D.2.3.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, test channel bandwidths and sub-carrier spacing based on NR operating bands specified in table 5.3.5-1. All of these configurations shall be tested with applicable test parameters for each combination of channel bandwidth and sub-carrier spacing, and are shown in clause 6.2D.3. The details of the uplink reference measurement channels (RMCs) are specified in Annexes A.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Table 6.5D.2.3.4.1-1: Void

Table 6.5D.2.3.4.1-2: Void

Table 6.5D.2.3.4.1-3: Void

1. Connect the SS to the UE antenna connectors as shown in TS 38.508-1 [5] Annex A, Figure A.3.1.1.2 for TE diagram and section A.3.2 for UE diagram.

2. The parameter settings for the cell are set up according to TS 38.508-1 [5] subclause 4.4.3.

3. Downlink signals are initially set up according to Annex C.0, C.1, C.2, and uplink signals according to Annex G.0, G.1, G.2, G.3.0.

4. The UL Reference Measurement channels are set according to applicable test configuration table in clause 6.2D.3.4.1.

5. Propagation conditions are set according to Annex B.0.

6. Ensure the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity *NR,* Connected without release On, Test Mode On and Test Loop Function On according to TS 38.508-1 [5] clause 4.5. Message contents are defined in clause 6.5D.2.3.4.3.

6.5D.2.3.4.2 Test procedure

Same test procedure as defined in clause 6.5D.2.2.4.2 with the following exceptions:

- Instead of Table 6.2D.2.5-1, test requirements in clause 6.2D.3.5 are applied in step 3;

- Instead of Table 6.5D.2.2.5-1, test requirements in clause 6.5D.2.3.5 are applied in step 4;

- Instead of Table 6.5D.2.2.4.1-2 and Table 6.5D.2.2.4.1-3, test configurations for ULFPTx in clause 6.2D.3 are applied in step 5;

6.5D.2.3.4.3 Message contents

Message contents are according to TS 38.508-1 [5] subclause 4.6 ensuring Table 4.6.3-182 with condition 2TX\_UL\_MIMO and exceptions listed in clause 6.2D.3.4.3.

6.5D.2.3.5 Test requirement

The measured sum of the UE mean power in the channel bandwidth, derived in step 3 and step 5 shall fulfill the requirements as specified in clause 6.2D.3.5 for NS\_35, NS\_04, NS\_03 and NS\_03U as appropriate, and the sum of power of any UE emission measured from both antennas in step 4 and step 5 shall fulfill requirements in current subclause.

Table 6.5D.2.3.5-1: Additional requirements for “NS\_35”

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Spectrum emission limit (dBm) / Channel bandwidth | | | | | |
| ΔfOOB  (MHz) | 5  MHz | 10  MHz | 15 MHz | 20 MHz | Measurement bandwidth (unless otherwise stated) |
| ± 0-0.1 | -15 + TT | -18 + TT | -20 + TT | -21 + TT | 30 kHz |
| ± 0.1-6 | -13 + TT | -13 + TT | -13 + TT | -13 + TT | 100 kHz |
| ± 6-10 | -251 + TT | -13 + TT | -13 + TT | -13 + TT | 100 kHz |
| ± 10-15 |  | -251 + TT | -13 + TT | -13 + TT | 100 kHz |
| ± 15-20 |  |  | -251 + TT | -13 + TT | 100 kHz |
| ± 20-25 |  |  |  | -25 + TT | 1 MHz |
| NOTE 1: The measurement bandwidth shall be 1 MHz;  NOTE 2: TT for each frequency and channel bandwidth is specified in Table 6.5D.2.3.5-2 | | | | | |

Table 6.5D.2.3.5-2: Test Tolerance (Spectrum Emission Mask)

|  |  |  |  |
| --- | --- | --- | --- |
|  | f ≤ 3.0GHz | 3.0GHz < f ≤ 4.2GHz | 4.2GHz < f ≤ 6.0GHz |
| BW ≤ 100MHz | 1.5 dB | 1.8 dB | 1.8 dB |

Table 6.5D.2.3.5-3: Additional requirements for "NS\_04"

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | Spectrum emission limit (dBm) / measurement bandwidth for each channel bandwidth | | | | | | | | | | | |
| **ΔfOOB**  **MHz** | **10** | **15** | **20** | **30** | **40** | **50** | **60** | **70** | **80** | **90** | **100** | **Measurement**  **bandwidth** |
| ± 0 - 1 | -10 + TT | -10 + TT | -10 + TT | -10 + TT | -10 + TT |  | | | | | | 2 % channel bandwidth |
|  |  | | | | | -10 + TT | | | | | | 1 MHz |
| ± 1 - 5 | -10 + TT | | | | | | | | | | | 1 MHz |
| ± 5 - X | -13 + TT | | | | | | | | | | |
| ± X - (BWChannel + 5 MHz) | -25 + TT | | | | | | | | | | |
| NOTE 1: X is defined in Table 6.5D.2.3.5-3a for CP-OFDM  NOTE 2: TT for each frequency and channel bandwidth is specified in Table 6.5D.2.3.5-2. | | | | | | | | | | | | |

Table 6.5D.2.3.5-3a: n41 maximum transmission bandwidths (MHz) for CP-OFDM

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| SCS (kHz) | Channel bandwidths (MHz) | | | | | | | | | | |
| 10 | 15 | 20 | 30 | 40 | 50 | 60 | 70 | 80 | 90 | 100 |
| 15 | 9.36 | 14.22 | 19.08 | 28.80 | 38.88 | 48.6 | N/A | N/A | N/A | N/A | N/A |
| 30 | 8.64 | 13.68 | 18.36 | 28.08 | 38.16 | 47.88 | 58.32 | 68.04 | 78.12 | 88.02 | 98.28 |
| 60 | 7.92 | 12.96 | 17.28 | 27.36 | 36.72 | 46.8 | 56.88 | 66.96 | 77.04 | 87.12 | 97.20 |

Table 6.5D.2.3.5-4: Additional requirements for "NS\_03 and NS\_03U"

|  |  |  |  |
| --- | --- | --- | --- |
| ΔfOOB  MHz | Channel bandwidth (MHz) / Spectrum emission limit (dBm) | | Measurement bandwidth |
|  | 5 | 10, 15, 20, 25, 30, 35, 40, 45 |  |
| ± 0-1 | -13 + TT | -13 + TT | 1 % of channel BW |
| ± 1-6 | -13 + TT | -13 + TT | 1 MHz |
| ± 6-10 | -25 + TT |
| ± 1-BWChannel |  |
| ± BWChannel-(BWChannel+5) |  | -25 + TT |
| NOTE 1: TT for each frequency and channel bandwidth is specified in Table 6.5D.2.3.5-2. | | | |

NOTE: As a general rule, the resolution bandwidth of the measuring equipment should be equal to the measurement bandwidth. However, to improve measurement accuracy, sensitivity and efficiency, the resolution bandwidth may be smaller than the measurement bandwidth. When the resolution bandwidth is smaller than the measurement bandwidth, the result should be integrated over the measurement bandwidth in order to obtain the equivalent noise bandwidth of the measurement bandwidth.

#### 6.5D.2.4 Adjacent channel leakage ratio for UL MIMO

Adjacent channel leakage power Ratio (ACLR) is the ratio of the filtered mean power centred on the assigned channel frequency to the filtered mean power centred on an adjacent channel frequency.

##### 6.5D.2.4.1 NR ACLR for UL MIMO

6.5D.2.4.1.1 Test purpose

To verify that UE transmitter does not cause unacceptable interference to adjacent channels in terms of Adjacent Channel Leakage power Ratio (ACLR).

6.5D.2.4.1.2 Test applicability

This test case applies to all types of NR Power Class 1.5, Power Class 2 and Power Class 3 UE release 15 and forward that supports 2-layer codebook based UL MIMO.

This test case applies to all types of NR Power Class 1.5, Power Class 2 and Power Class 3 UE release 16 and forward that support UL full power transmission (ULFPTx).

6.5D.2.4.1.3 Minimum conformance requirements

For UE supporting UL MIMO, the requirements for Out of band emissions resulting from the modulation process and non-linearity in the transmitters is defined as the sum of the emissions from both UEtransmit antenna connectors.

For UEs with two transmit antenna connectors in closed-loop spatial multiplexing scheme, the requirements in subclause 6.5.2.4.2.3 apply. The requirements shall be met with UL MIMO configurations described in clause 6.2D.1.3.

For UE support uplink full power transmission (ULFPTx) for UL MIMO, the requirements in clause 6.5.2.4.2.3 shall apply. The requirements shall be met with the PUSCH configurations specified in Table 6.2D.1.3-3, based upon UE’s support of uplink full power transmission mode.

If UE is scheduled for single antenna-port PUSCH transmission by DCI format 0\_0 or by DCI format 0\_1 for single antenna port codebook based transmission, the requirements in clause 6.5.2.4.2.3 apply.

The normative reference for this requirement is TS 38.101-1 [2] clauses and 6.5D.2 and 6.5.2.4.1.

6.5D.2.4.1.4 Test description

6.5D.2.4.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, test channel bandwidths and sub-carrier spacing based on NR operating bands specified in Table 5.3.5-1. All of these configurations shall be tested with applicable test parameters for each combination of channel bandwidth and sub-carrier spacing, are shown in the test configuration tables in clause 6.2D.2. 4.1. The details of the uplink reference measurement channels (RMCs) are specified in Annexes A.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2

Table 6.5D.2.4.1.4.1-1: Void

1. Connect the SS to the UE antenna connectors as shown in TS 38.508-1 [5] Annex A, Figure A.3.1.1.2 for TE diagram and section A.3.2 for UE diagram.

2. The parameter settings for the cell are set up according to TS 38.508-1 [5] subclause 4.4.3.

3. Downlink signals are initially set up according to Annex C.0, C.1, C.2, and uplink signals according to Annex G.0, G.1, G.2, G.3.0.

4. The UL Reference Measurement channels are set according to the test configuration tables in clause 6.2D.2.4.1.

5. Propagation conditions are set according to Annex B.0

6. Ensure the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On,* Test Mode *On* and Test Loop Function *On* according to TS 38.508-1 [5] clause 4.5. Message contents are defined in clause 6.5D.2.4.1.4.3 (If UE supports ULFPTx. The PDCCH DCI format 0\_1 is specified with the condition ULFPTx\_Mode1, ULFPTx\_Mode2 or ULFPTx\_ModeFull in 38.508-1 [5] subclause 4.3.6.1.1.2 depending on UE reported capability.)

6.5D.2.4.1.4.2 Test procedure

1. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0\_1 for C\_RNTI to schedule the UL RMC according to the test configuration tables in clause 6.2D.2. 4.1. Since the UL has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC. The PDCCH DCI format 0\_1 is specified with condition 2TX\_UL\_MIMO in 38.508-1 [5] subclause 4.3.6.1.1.2

2. Send continuously power control “up” commands to the UE until the UE transmits at PUMAX level. Allow at least 200ms for the UE to reach PUMAX level.

3. Measure the sum of the mean power of the UE at from both antenna connectors in the channel bandwidth of the radio access mode according to the test configuration, as measured in step 3 of 6.2D.2.4.2,which shall meet the requirements described in clause 6.2D.2.5 as appropriate.

4. Measure the sum of the rectangular filtered mean power for the assigned NR channel at each antenna connector of UE using a rms detector. If the sweep count is higher than one, the trace mode shall be average.

5. Measure the sum of rectangular filtered mean power of the first NR adjacent channel at each antenna connector of UE on both lower and upper side of the assigned NR channel using a rms detector, respectively. If the sweep count is higher than one, the trace mode shall be average.

6. Calculate the ratios of the power between the values measured in step 4 over step 5 for lower and upper NR ACLR, respectively.

7. If UE supports ULFPTx, repeat test steps 1~6 with UL RMC according to Table 6.2D.2.4.1-1a through Table 6.2D.2.4.1-3a. The PDCCH DCI format 0\_1 is specified with the condition ULFPTx\_Mode1, ULFPTx\_Mode2 or ULFPTx\_ModeFull in 38.508-1 [5] subclause 4.3.6.1.1.2 depending on UE reported capability.

6.5D.2.4.1.4.3 Message contents

Message contents are according to TS 38.508-1 [5] subclause 4.6 ensuring Table 4.6.3-182 with condition 2TX\_UL\_MIMO.

6.5D.2.4.1.5 Test requirement

The measured UE mean total power derived in step 3, shall fulfil requirements in Clause 6.2D.2.5 as appropriate, and if the measured adjacent channel power is greater than –50 dBm then the measured NR ACLR, derived in step 6 for each antenna connector, shall be higher than the limits in Table 6.5D.2.4.1.5-2.

Table 6.5D.2.4.1.5-1: Void

Table 6.5D.2.4.1.5-2: NR ACLR requirement

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Power class 1 | Power class 1.5 | Power class 2 | Power class 3 |
| NR ACLR |  | 31 - TT dB | 31 - TT dB | 30 - TT dB |
| NOTE 1: TT = 0.8 dB | | | | |

##### 6.5D.2.4.1\_1 NR ACLR for SUL with UL MIMO

6.5D.2.4.1\_1.1 Test purpose

To verify that UE transmitter does not cause unacceptable interference to adjacent channels in terms of Adjacent Channel Leakage Power Ratio (ACLR).

6.5D.2.4.1\_1.2 Test applicability

This test case applies to all types of NR UE release 17 and forward that support SUL and UL MIMO operating on the SUL bands.

6.5D.2.4.1\_1.3 Minimum conformance requirements

For a terminal that supports SUL for the band combination specified in Table 5.2C-1, the current version of the specification assumes the terminal is configured with active transmission either on UL carrier or SUL carrier at any time in one serving cell and the UE requirements for single carrier shall apply for the active UL or SUL carrier accordingly.

For UE supporting UL MIMO, the requirements for Out of band emissions resulting from the modulation process and non-linearity in the transmitters is defined as the sum of the emissions from both UEtransmit antenna connectors.

For UEs with two transmit antenna connectors in closed-loop spatial multiplexing scheme, the requirements in subclause 6.5.2.4.2.3 apply. The requirements shall be met with UL MIMO configurations described in clause 6.2D.1\_1.3.

The normative reference for this requirement is TS 38.101-1 [2] clauses and 6.5D.2 and 6.5.2.4.1.

6.5D.2.4.1\_1.4 Test description

6.5D.2.4.1\_1.4.1 Initial conditions

Same initial conditions as in 6.2D.2\_1.4.1.

6.5D.2.4.1\_1.4.2 Test procedure

1. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0\_1 for C\_RNTI to schedule the UL RMC according to the test configuration tables in clause 6.2D.2\_1. 4.1. Since the UL has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC. The PDCCH DCI format 0\_1 is specified with condition 2TX\_UL\_MIMO in 38.508-1 [5] subclause 4.3.6.1.1.2

2. Send continuously power control “up” commands to the UE until the UE transmits at PUMAX level. Allow at least 200ms for the UE to reach PUMAX level.

3. Measure the sum of the mean power of the UE at from both antenna connectors in the channel bandwidth of the radio access mode according to the test configuration, as measured in step 3 of 6.2D.2\_1.4.2, which shall meet the requirements described in clauses 6.2D.2\_1.5 as appropriate.

4. Measure the sum of the rectangular filtered mean power for the assigned NR channel at each antenna connector of UE using a rms detector. If the sweep count is higher than one, the trace mode shall be average.

5. Measure the sum of rectangular filtered mean power of the first NR adjacent channel at each antenna connector of UE on both lower and upper side of the assigned NR channel using a rms detector, respectively. If the sweep count is higher than one, the trace mode shall be average.

6. Calculate the ratios of the power between the values measured in step 4 over step 5 for lower and upper NR ACLR, respectively.

6.5D.2.4.1\_1.4.3 Message contents

Message contents in initial conditions are according to TS 38.508-1 [5] subclause 4.3.6.1.1.2 ensuring UL/SUL indicator in Table 4.3.6.1.1.2-1 with condition SUL, subclause 4.6 ensuring Table 4.6.1-28 with condition SUL AND (RF OR RRM), Table 4.6.3-14 with condition SUL\_SUL for SUL carrier, and Table 4.6.3-167 with condition PUSCH\_PUCCH\_ON\_SUL.

Message contents are according to TS 38.508-1 [5] subclause 4.6 ensuring Table 4.6.3-182 with condition 2TX\_UL\_MIMO.

6.5D.2.4.1\_1.5 Test requirement

The measured UE mean total power derived in step 3, shall fulfil requirements in clause 6.2D.2\_1.5 as appropriate, and if the measured adjacent channel power is greater than –50 dBm then the measured NR ACLR, derived in step 6 for each antenna connector, shall be higher than the limits in Table 6.5D.2.4.1\_1.5-1.

Table 6.5D.2.4.1\_1.5-1: NR ACLR requirement

|  |  |  |  |
| --- | --- | --- | --- |
|  | Power class 1 | Power class 2 | Power class 3 |
| NR ACLR |  | 31 - TT dB | 30 - TT dB |
| NOTE 1: TT = 0.8 dB | | | |

##### 6.5D.2.4.2 UTRA ACLR for UL MIMO

6.5D.2.4.2.1 Test purpose

To verify that UE transmitter does not cause unacceptable interference to adjacent channels in terms of Adjacent Channel Leakage power Ratio (ACLR).

6.5D.2.4.2.2 Test applicability

This test case applies for NS\_03U, NS\_05U, and NS\_100 to all types of NR Power Class 1.5, Power Class 2 and Power Class 3 UE release 15 and forward that supports 2-layer codebook based UL MIMO.

6.5D.2.4.2.3 Minimum conformance requirements

For UE supporting UL MIMO, the requirements for Out of band emissions resulting from the modulation process and non-linearity in the transmitters is defined as the sum of the emissions from both UE transmit antenna connectors.

For UEs with two transmit antenna connectors in closed-loop spatial multiplexing scheme, the requirements in subclause 6.5.2.4.2.3 apply. The requirements shall be met with UL MIMO configurations described in clause 6.2D.1.3.

For UE support uplink full power transmission (ULFPTx) for UL MIMO, the requirements in clause 6.5.2.4.2.3 shall apply. The requirements shall be met with the PUSCH configurations specified in Table 6.2D.1.3-3, based upon UE’s support of uplink full power transmission mode.

If UE is scheduled for single antenna-port PUSCH transmission by DCI format 0\_0 or by DCI format 0\_1 for single antenna port codebook based transmission, the requirements in clause 6.5.2.4.2.3 apply.

The normative reference for this requirement is TS 38.101-1 [2] clauses 6.5D.2 and 6.5.2.4.2.

6.5D.2.4.2.4 Test description

6.5D.2.4.2.4.1 Initial conditions

Same as in subclause 6.2D.3.4.1 with the following exception;

- Only network signalling values NS\_03U, NS\_05U, NS\_100 with the corresponding band defined in Table 6.2.3.3.1-1 need to perform UTRA ACLR for MIMO testing.

- Message contents in step 6 are defined in clause 6.5D.2.4.2.4.3.

Table 6.5D.2.4.2.4.1-1: Void

Table 6.5D.2.4.2.4.1-2: Void

6.5D.2.4.2.4.2 Test procedure

1. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0\_1 for C\_RNTI to schedule the UL RMC according to the applicable test configuration table in clause 6.2D.3.4.1. Since the UL has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC. The PDCCH DCI format 0\_1 is specified with condition 2TX\_UL\_MIMO in 38.508-1 [5] subclause 4.3.6.1.1.2

2. Send continuously power control “up” commands to the UE until the UE transmits at PUMAX level. Allow at least 200ms for the UE to reach PUMAX level.

3. Measure the sum of the mean power of the UE at each antenna connector in the channel bandwidth of the radio access mode according to the test configuration, which shall meet the requirements described in clause 6.2D.3.5 as appropriate. The period of the measurement shall be at least the continuous duration of 1ms over consecutive active uplink slots and uplink symbols. For TDD, only slots consisting of only UL symbols are under test.

4. Measure the sum of the rectangular filtered mean power for the assigned NR channel at each antenna connector of UE using a rms detector. If the sweep count is higher than one, the trace mode shall be average.

5. Measure the sum of the RRC filtered mean power of the first and the second UTRA adjacent channel at each antenna connector of UE on both lower and upper side of the assigned NR channel using a rms detector, respectively. If the sweep count is higher than one, the trace mode shall be average.

6. Calculate the ratio of the power between the values measured in step 4 over step 5 for UTRAACLR1, UTRAACLR2 for both lower an upper side of the assigned NR channel, respectively.

7. If UE supports ULFPTx, repeat test steps 1~6 with UL RMC according to the applicable test configuration table supporting ULFPTx in clause 6.2D.3.4.1. The PDCCH DCI format 0\_1 is specified with the condition ULFPTx\_Mode1, ULFPTx\_Mode2 or ULFPTx\_ModeFull in 38.508-1 [5] subclause 4.3.6.1.1.2 depending on UE reported capability.

6.5D.2.4.2.4.3 Message contents

Message contents are according to TS 38.508-1 [5] subclause 4.6 ensuring Table 4.6.3-182 with condition 2TX\_UL\_MIMO and with the exception specified in Table 6.5D.2.4.2.4.3 - 1

Table 6.5D.2.4.2.4.3-1: *AdditionalSpectrumEmission*: UTRA ACLR test requirement for "NS\_XX"

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [5] clause 4.6.3, Table 4.6.3-1 AdditionalSpectrumEmission from SIB1 | | | |
| Information Element | Value/remark | Comment | Condition |
| AdditionalSpectrumEmission | 1 | NS\_100 for band n1, n2, n3, n5, n25, n66, n80, n84 NOTE1 |  |
| 3 | NS\_03U for n2, n25, n66  NS\_05U for n1, n84 |  |
|  | 4 | NS\_05U for n65 |  |
| NOTE 1: This NS can be signalled for NR bands that have UTRA services deployed | | | |

6.5D.2.4.2.5 Test requirement

UTRA ACLR requirement is applicable when signalled by the network with network signalling value indicated by the field *additionalSpectrumEmission*.

The measured UE mean total power in the channel bandwidth at all the antenna connectors, derived in step 3, shall fulfil requirements in Clause 6.2D.3.5 as appropriate, and if the measured adjacent channel power is greater than –50 dBm then the measured UTRA ACLR, derived in step 6 for each antenna connector, shall be higher than the limits in Table 6.5D.2.4.2.5-1.

Table 6.5D.2.4.2.5-1: UTRA ACLR requirement

|  |  |
| --- | --- |
|  | Power class 3 |
| UTRAACLR1 | 33 dB - TT |
| UTRAACLR2 | 36 dB - TT |
| NOTE 1: TT = 0.8 dB | |

##### 6.5D.2.4.2\_1 UTRA ACLR for SUL with UL MIMO

6.5D.2.4.2\_1.1 Test purpose

To verify that UE transmitter does not cause unacceptable interference to adjacent channels in terms of Adjacent Channel Leakage power Ratio (ACLR).

6.5D.2.4.2\_1.2 Test applicability

This test case applies for NS\_05U to all types of NR UE release 17 and forward that support SUL and UL MIMO operating on the SUL bands.

6.5D.2.4.2\_1.3 Minimum conformance requirements

For a terminal that supports SUL for the band combination specified in Table 5.2C-1, the current version of the specification assumes the terminal is configured with active transmission either on UL carrier or SUL carrier at any time in one serving cell and the UE requirements for single carrier shall apply for the active UL or SUL carrier accordingly.

For UE supporting UL MIMO, the requirements for Out of band emissions resulting from the modulation process and non-linearity in the transmitters is defined as the sum of the emissions from both UE transmit antenna connectors.

For UEs with two transmit antenna connectors in closed-loop spatial multiplexing scheme, the requirements in subclause 6.5.2.4.2.3 apply. The requirements shall be met with UL MIMO configurations described in clause 6.2D.1\_1.3.

The normative reference for this requirement is TS 38.101-1 [2] clauses 6.5D.2 and 6.5.2.4.2.

6.5D.2.4.2\_1.4 Test description

6.5D.2.4.2\_1.4.1 Initial conditions

S Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, test channel bandwidths and sub-carrier spacing based on NR operating bands specified in Table 5.5C-1. All of these configurations shall be tested with applicable test parameters for each combination of channel bandwidth and sub-carrier spacing, are shown in table 6.5D.2.4.2\_1.4.1-1. The details of the uplink reference measurement channels (RMCs) are specified in Annexes A.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2

Table 6.5D.2.4.2\_1.4.1-1: Test Configuration Table for NS\_05U

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Initial Conditions | | | | | | | | |
| Test Environment as specified in TS 38.508-1 [5] subclause 4.1 | | | | | Normal | | | |
| Test Frequencies as specified in TS 38.508-1 [5] subclause 4.3.1 | | | | | SUL carrier: Use Fc as specified in test parameters  NUL carrier: Mid range | | | |
| Test Channel Bandwidths as specified in TS 38.508-1 [5] subclause 4.3.1 | | | | | SUL carrier: 5 MHz, 10 MHz, 15 MHz, 20 MHz  NUL carrier: Highest | | | |
| Test SCS as specified in Table 5.3.5-1 | | | | | 15kHz for SUL and Lowest supported SCS for NUL carrier | | | |
| AMPR Test parameters for NS\_05U | | | | | | | | |
| Test ID | Fc  (MHz) | ChBw (MHz) | Downlink Config. | Uplink config | A-MPR | SUL Configuration | | |
| Modulation  (NOTE 2) | | RB allocation (Note 1) |
| 1 | 1922.5 | 5 |  |  | A3 | CP-OFDM | QPSK | Outer\_Full |
| 2 | 1925 | 10 | A1 | QPSK | Outer\_Full |
| 3 | 1925 | 10 | A7 | QPSK | 42@10 |
| 4 | 1925 | 10 | A2 | QPSK | 6@40 |
| 5 | 1935 | 10 | A4 | QPSK | Outer\_Full |
| 6 | 1927.5 | 15 | A1 | QPSK | Outer\_Full |
| 7 | 1927.5 | 15 | A7 | QPSK | 60@19 |
| 8 | 1927.5 | 15 | A2 | QPSK | 6@56 |
| 9 | 1932.5 | 15 | A1 | QPSK | Outer\_Full |
| 10 | 1932.5 | 15 | A2 | QPSK | 6@68 |
| 11 | 1942.5 | 15 | A5 | QPSK | Outer\_Full |
| 12 | 1930 | 20 | A1 | QPSK | Outer\_Full |
| 13 | 1930 | 20 | A7 | QPSK | 78@28 |
| 14 | 1930 | 20 | A2 | QPSK | 6@76 |
| 15 | 1950 | 20 | A6 | QPSK | Outer\_Full |
| 16 | 1922.5 | 5 | A3 | 16 QAM | Outer\_Full |
| 17 | 1925 | 10 | A1 | 16 QAM | Outer\_Full |
| 18 | 1925 | 10 | A7 | 16 QAM | 42@10 |
| 19 | 1925 | 10 | A2 | 16 QAM | 6@40 |
| 20 | 1935 | 10 | A4 | 16 QAM | Outer\_Full |
| 21 | 1927.5 | 15 | A1 | 16 QAM | Outer\_Full |
| 22 | 1927.5 | 15 | A7 | 16 QAM | 60@19 |
| 23 | 1927.5 | 15 | A2 | 16 QAM | 6@56 |
| 24 | 1932.5 | 15 | A1 | 16 QAM | Outer\_Full |
| 25 | 1932.5 | 15 | A2 | 16 QAM | 6@68 |
| 26 | 1942.5 | 15 | A5 | 16 QAM | Outer\_Full |
| 27 | 1930 | 20 | A1 | 16 QAM | Outer\_Full |
| 28 | 1930 | 20 | A7 | 16 QAM | 78@28 |
| 29 | 1930 | 20 | A2 | 16 QAM | 6@76 |
| 30 | 1950 | 20 | A6 | 16 QAM | Outer\_Full |
| 31 | 1922.5 | 5 | A3 | 64 QAM | Outer\_Full |
| 32 | 1925 | 10 | A1 | 64 QAM | Outer\_Full |
| 33 | 1925 | 10 | A7 | 64 QAM | 42@10 |
| 34 | 1925 | 10 | A2 | 64 QAM | 6@40 |
| 35 | 1935 | 10 | A4 | 64 QAM | Outer\_Full |
| 36 | 1927.5 | 15 | A1 | 64 QAM | Outer\_Full |
| 37 | 1927.5 | 15 | A7 | 64 QAM | 60@19 |
| 38 | 1927.5 | 15 | A2 | 64 QAM | 6@56 |
| 39 | 1932.5 | 15 | A1 | 64 QAM | Outer\_Full |
| 40 | 1932.5 | 15 | A2 | 64 QAM | 6@68 |
| 41 | 1942.5 | 15 | A5 | 64 QAM | Outer\_Full |
| 42 | 1930 | 20 | A1 | 64 QAM | Outer\_Full |
| 43 | 1930 | 20 | A7 | 64 QAM | 78@28 |
| 44 | 1930 | 20 | A2 | 64 QAM | 6@76 |
| 45 | 1950 | 20 | A6 | 64 QAM | Outer\_Full |
| 46 | 1922.5 | 5 | A3 | 256 QAM | Outer\_Full |
| 47 | 1925 | 10 | A1 | 256 QAM | Outer\_Full |
| 48 | 1925 | 10 | A7 | 256 QAM | 42@10 |
| 49 | 1935 | 10 | A4 | 256 QAM | Outer\_Full |
| 50 | 1927.5 | 15 | A1 | 256 QAM | Outer\_Full |
| 51 | 1927.5 | 15 | A7 | 256 QAM | 60@19 |
| 52 | 1932.5 | 15 | A1 | 256 QAM | Outer\_Full |
| 53 | 1942.5 | 15 | A5 | 256 QAM | Outer\_Full |
| 54 | 1930 | 20 | A1 | 256 QAM | Outer\_Full |
| 55 | 1930 | 20 | A7 | 256 QAM | 78@28 |
| 56 | 1950 | 20 | A6 | 256 QAM | Outer\_Full |
| NOTE 1: The specific configuration of each RB allocation is defined in Table 6.1-1 unless otherwise stated in this table. | | | | | | | | |

1. Connect the SS to the UE antenna connectors as shown in TS 38.508-1 [5] Annex A, Figure A.3.1.1.2 for TE diagram and section A.3.2 for UE diagram.

2. The parameter settings for the cell are set up according to TS 38.508-1 [5] subclause 4.4.3.

3. Downlink signals are initially set up according to Annex C.0, C.1, C.2, and uplink signals according to Annex G.0, G.1, G.2, G.3.0 with consideration of supplementary uplink physical channels.

4. The UL Reference Measurement channels are set according to Table 6.5D.2.4.2\_1.4.1-1.

5. Propagation conditions are set according to Annex B.0

6. Ensure the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On,* Test Mode *On* and Test Loop Function *On* according to TS 38.508-1 [5] clause 4.5. Message contents are defined in clause 6.5D.2.4.2\_1.4.3

6.5D.2.4.2\_1.4.2 Test procedure

1. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0\_1 for C\_RNTI to schedule the UL RMC according to the test configuration tables in clause 6.2D.3\_1. 4.1. Since the UL has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC. The PDCCH DCI format 0\_1 is specified with condition 2TX\_UL\_MIMO in 38.508-1 [5] subclause 4.3.6.1.1.2

2. Send continuously power control “up” commands to the UE until the UE transmits at PUMAX level. Allow at least 200ms for the UE to reach PUMAX level.

3. Measure the sum of the mean power of the UE at each antenna connector in the channel bandwidth of the radio access mode according to the test configuration, which shall meet the requirements described in clause 6.2D.3\_1.5 as appropriate. The period of the measurement shall be at least the continuous duration of 1ms over consecutive active uplink slots and uplink symbols. For TDD, only slots consisting of only UL symbols are under test.

4. Measure the sum of the rectangular filtered mean power for the assigned NR channel at each antenna connector of UE using a rms detector. If the sweep count is higher than one, the trace mode shall be average.

5. Measure the sum of the RRC filtered mean power of the first and the second UTRA adjacent channel at each antenna connector of UE on both lower and upper side of the assigned NR channel using a rms detector, respectively. If the sweep count is higher than one, the trace mode shall be average.

6. Calculate the ratio of the power between the values measured in step 4 over step 5 for UTRAACLR1, UTRAACLR2 for both lower an upper side of the assigned NR channel, respectively.

6.5D.2.4.2\_1.4.3 Message contents

Message contents in initial conditions are according to TS 38.508-1 [5] subclause 4.3.6.1.1.2 ensuring UL/SUL indicator in Table 4.3.6.1.1.2-1 with condition SUL, subclause 4.6 ensuring Table 4.6.1-28 with condition SUL AND (RF OR RRM), Table 4.6.3-14 with condition SUL\_SUL for SUL carrier, and Table 4.6.3-167 with condition PUSCH\_PUCCH\_ON\_SUL.

Message contents are according to TS 38.508-1 [5] subclause 4.6 ensuring Table 4.6.3-182 with condition 2TX\_UL\_MIMO and with the exception specified in Table 6.5D.2.4.2\_1.4.3-1.

Table 6.5D.2.4.2\_1.4.3-1: *AdditionalSpectrumEmission*: UTRA ACLR test requirement for NS\_05U

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [5] clause 4.6.3, Table 4.6.3-1 AdditionalSpectrumEmission from SIB1 | | | |
| Information Element | Value/remark | Comment | Condition |
| AdditionalSpectrumEmission | 3 | NS\_05U for band n84 |  |

6.5D.2.4.2\_1.5 Test requirement

UTRA ACLR requirement is applicable when signalled by the network with network signalling value indicated by the field *additionalSpectrumEmission*.

The measured UE mean total power in the channel bandwidth at all the antenna connectors, derived in step 3, shall fulfil requirements in clause 6.2D.3\_1.5 as appropriate, and if the measured adjacent channel power is greater than –50 dBm then the measured UTRA ACLR, derived in step 6, shall be higher than the limits in Table 6.5D.2.4.2\_1.5-1.

Table 6.5D.2.4.2\_1.5-1: UTRA ACLR requirement

|  |  |
| --- | --- |
|  | Power class 3 |
| UTRAACLR1 | 33 dB - TT |
| UTRAACLR2 | 36 dB - TT |
| NOTE 1: TT = 0.8 dB | |

### 6.5D.2\_1 Void

### 6.5D.3 Spurious emissions for UL MIMO

For UE supporting UL MIMO, the requirements for Spurious emissions which are caused by unwanted transmitter effects such as harmonics emission, parasitic emissions, intermodulation products and frequency conversion products are specified at each transmit antenna connector.

For UEs with two transmit antenna connectors in closed-loop spatial multiplexing scheme, the requirements specified in subclause 6.5.3 apply to each transmit antenna connector. The requirements shall be met with the UL MIMO configurations described in sub-clause 6.2D.1.3.

If UE is configured for transmission on single-antenna port, the requirements in subclause 6.5.3 apply.

The normative reference for this requirement is TS 38.101-1 [2] clause 6.5D.3

#### 6.5D.3.1 General spurious emissions for UL MIMO

6.5D.3.1.1 Test purpose

To verify that UE transmitter does not cause unacceptable interference to other channels or other systems in terms of transmitter spurious emissions.

6.5D.3.1.2 Test applicability

This test case applies to all types of NR Power Class 1.5, Power Class 2 and Power Class 3 UE release 15 that support 2-layer codebook based UL MIMO.

6.5D.3.1.3 Minimum conformance requirements

The general spurious emission requirement specified in clause 6.5.3.1.3 applies to each antenna connector of the UE.

The normative reference for this requirement is TS 38.101-1 [2] subclauses 6.5D.3 and 6.5.3.1.

6.5D.3.1.4 Test description

6.5D.3.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, test channel bandwidths and sub-carrier spacing based on NR operating bands specified in Table 5.3.5-1. All of these configurations shall be tested with applicable test parameters for each combination of channel bandwidth and sub-carrier spacing, are shown in table 6.5D.3.1.4.1-1. The details of the uplink reference measurement channels (RMCs) are specified in Annexes A.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Table 6.5D.3.1.4.1-1: Test Configuration Table

|  |  |  |  |
| --- | --- | --- | --- |
| Initial Conditions | | | |
| Test Environment as specified in TS 38.508-1 [5] subclause 4.1. | | Normal | |
| Test Frequencies as specified in TS 38.508-1 [5] subclause 4.3.1. | | Low range, Mid range, High range | |
| Test Channel Bandwidths as specified in TS 38.508-1 [5] subclause 4.3.1. | | Lowest, Mid, Highest | |
| Test SCS as specified in Table 5.3.5-1 | | Lowest | |
| Test Parameters | | | |
| Test ID | Downlink Configuration | Uplink Configuration | |
|  | N/A for Spurious Emissions testing | Modulation | RB allocation (NOTE 1) |
| 1 | CP-OFDM QPSK | OuterFull |
| 2 | CP-OFDM QPSK | Edge\_1RB\_Left |
| 3 | CP-OFDM QPSK | Edge\_1RB\_Right |
| NOTE 1: The specific configuration of each RB allocation is defined in Table 6.1-1 Common UL configuration | | | |

1. Connect the SS to the UE antenna connectors as shown in TS 38.508-1 [5] Annex [A, Figure A.3.1.2.2 for TE diagram and section A.3.2 for UE diagram.

2. The parameter settings for the cell are set up according to TS 38.508-1 [5] subclause 4.4.3.

3. Downlink signals are initially set up according to Annex C.0, C.1 and C.2, and uplink signals according to Annex G.0, G.1, G.2, and G.3.0.

4. The UL Reference Measurement channels are set according to Table 6.5.3.1.4.1-1.

5. Propagation conditions are set according to Annex B.0.

6. Ensure the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On,* Test Mode *On* and Test Loop Function *On* according to TS 38.508-1 [5] clause 4.5. Message contents are defined in clause 6.5D.3.1.4.3.

6.5D.3.1.4.2 Test procedure

1. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0\_1 for C\_RNTI to schedule the UL RMC according to Table 6.5D.3.1.4.1-1. Since the UE has no payload data to send, the UE transmits uplink MAC padding bits on the UL RMC. The PDCCH DCI format 0\_1 is specified with condition 2TX\_UL\_MIMO in 38.508-1 [5] subclause 4.3.6.1.1.2.

2. Send continuously uplink power control "up" commands in the uplink scheduling information to the UE until the UE transmits at PUMAX level.

3. Measure the power of the transmitted signal at each antenna connector with a measurement filter of bandwidths according to table 6.5D.3.1.5-1. The centre frequency of the filter shall be stepped in contiguous steps according to table 6.5D.3.1.5-1. The measured power shall be verified for each step. The measurement period shall capture the active time slots. During measurement the spectrum analyser shall be set to 'Detector' = RMS. If the sweep count is higher than one, the trace mode shall be average.

6.5D.3.1.4.3 Message contents

Message contents are according to TS 38.508-1 [5] subclause 4.6 ensuring Table 4.6.3-182 with condition 2TX\_UL\_MIMO.

6.5D.3.1.5 Test requirement

The measured average power of spurious emission at each antenna connector, derived in step 3, shall not exceed the described value in Table 6.5D.3.1.5-1.

The spurious emission limits apply for the frequency ranges that are more than ΔfOOB (MHz) in Table 6.5.3.1.3-1from the edge of the channel bandwidth.

Table 6.5D.3.1.5-1: General spurious emissions test requirements

|  |  |  |  |
| --- | --- | --- | --- |
| Frequency Range | Maximum Level | Measurement bandwidth | NOTE |
| 9 kHz ≤ f < 150 kHz | -36 dBm | 1 kHz |  |
| 150 kHz ≤ f < 30 MHz | -36 dBm | 10 kHz |  |
| 30 MHz ≤ f < 1000 MHz | -36 dBm | 100 kHz |  |
| 1 GHz ≤ f < 12.75 GHz | -30 dBm | 1 MHz |  |
| 12.75 GHz ≤ f < 5th harmonic of the upper frequency edge of the UL operating band in GHz | -30 dBm | 1 MHz | 1 |
| 12.75 GHz < f < 26 GHz | -30 dBm | 1 MHz | 2 |
| NOTE 1: Applies for Band that the upper frequency edge of the UL Band more than 2.69 GHz  NOTE 2: Applies for Band that the upper frequency edge of the UL Band more than 5.2 GHz | | | |

#### 6.5D.3.2 Spurious emissions for UE co-existence for UL MIMO

6.5D.3.2.1 Test purpose

To verify that UE transmitter does not cause unacceptable interference to co-existing systems for the specified bands which has specific requirements in terms of transmitter spurious emissions.

6.5D.3.2.2 Test applicability

This test case applies to all types of NR Power Class 1.5, Power Class 2 and Power Class 3 UE release 15 that support 2-layer codebook based UL MIMO.

6.5D.3.2.3 Minimum conformance requirements

The requirements for NR bands for coexistence with protected bands specified in subclause 6.5.3.2.3 apply to each UE transmit antenna connector

The normative reference for this requirement is TS 38.101-1 [2] subclauses 6.5.3.2 and 6.5D.3.

6.5D.3.2.4 Test description

6.5D.3.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, test channel bandwidths and sub-carrier spacing based on NR operating bands specified in Table 5.3.5-1. All of these configurations shall be tested with applicable test parameters for each combination of channel bandwidth and sub-carrier spacing, are shown in table 6.5D.3.2.4.1-1. The details of the uplink reference measurement channels (RMCs) are specified in Annexes A.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Table 6.5D.3.2.4.1-1: Test Configuration Table

|  |  |  |  |
| --- | --- | --- | --- |
| Initial Conditions | | | |
| Test Environment as specified in TS 38.508-1 [5] subclause 4.1. | | Normal | |
| Test Frequencies as specified in TS 38.508-1 [5] subclause 4.3.1. | | Low range, Mid range, High range | |
| Test Channel Bandwidths as specified in TS 38.508-1 [5] subclause 4.3.1. | | Lowest, Mid, Highest | |
| Test SCS as specified in Table 5.3.5-1 | | Lowest | |
| Test Parameters | | | |
| Test ID | Downlink Configuration | Uplink Configuration | |
|  | N/A for Spurious Emissions testing | Modulation | RB allocation (NOTE 1) |
| 1 | CP-OFDM QPSK | Outer\_Full |
| 2 | CP-OFDM QPSK | Edge\_1RB\_Left |
| 3 | CP-OFDM QPSK | Edge\_1RB\_Right |
| NOTE 1: The specific configuration of each RB allocation is defined in Table 6.1-1 Common UL configuration. | | | |

1. Connect the SS to the UE antenna connectors as shown in TS 38.508-1 [5] Annex A, Figure A.3.1.2.2 for TE diagram and section A.3.2 for UE diagram.

2. The parameter settings for the cell are set up according to TS 38.508-1 [6] subclause 4.4.3..

3. Downlink signals are initially set up according to Annex C.0, C.1, C.2, and uplink signals according to Annex G.0, G.1, G.2, G.3.0.

4. The UL Reference Measurement channels are set according to Table 6.5D.3.2.4.1-1.

5. Propagation conditions are set according to Annex B.0.

6. Ensure the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On,* Test Mode *On* and Test Loop Function *On* according to TS 38.508-1 [5] clause 4.5. Message contents are defined in clause 6.5D.3.2.4.3.

6.5D.3.2.4.2 Test procedure

1 SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0\_1 for C\_RNTI to schedule the UL RMC according to Table 6.5D.3.2.4.1-1. Since the UE has no payload data to send, the UE transmits uplink MAC padding bits on the UL RMC. The PDCCH DCI format 0\_1 is specified with condition 2TX\_UL\_MIMO in 38.508-1 [5] subclause 4.3.6.1.1.2.

2. Send continuously uplink power control "up" commands in the uplink scheduling information to the UE until the UE transmits at PUMAX level.

3. Measure the power of the transmitted signal at each UE antenna connector with a measurement filter of bandwidths according to 6.5.3.2.3. The centre frequency of the filter shall be stepped in contiguous steps according to 6.5.3.2.3. The measured power shall be verified for each step. The measurement period shall capture the active time slots. During measurement the spectrum analyser shall be set to 'Detector' = RMS. If the sweep count is higher than one, the trace mode shall be average.

6.5D.3.2.4.3 Message contents

Message contents are according to TS 38.508-1 [5] subclause 4.6 ensuring Table 4.6.3-182 with condition 2TX\_UL\_MIMO.

6.5D.3.2.5 Test requirement

Test requirements for Spurious Emissions UE Co-existence are the same as the minimum requirements and are not repeated in this section.

The measured average power of spurious emission, derived in step 3 at each UE antenna connector, shall not exceed the described value in clause 6.5.3.2.3 according to the following rule:

The release of the requirements for the UE depends on vendor declaration, and shall not be less than the UE release.

If there is no vendor declaration, the default release of requirements is same as UE release (if UE support a band from a later release compare to UE release, the release of requirements is the earliest release where requirements for this band are defined).

#### 6.5D.3.3 Additional spurious emissions for UL MIMO

Editor’s note: This clause is incomplete. The following aspects are either missing or not yet determined:

- There are NS-XXs other than NS\_04, NS\_21 and NS\_47 that are FFS:

6.5D.3.3.1 Test purpose

To verify that UE transmitter does not cause unacceptable interference to other channels or other systems in terms of transmitter spurious emissions under the deployment scenarios where additional requirements are specified.

6.5D.3.3.2 Test applicability

This test case applies to all types of NR Power Class 1.5, Power Class 2 and Power Class 3 UE release 15 that support 2-layer codebook based UL MIMO.

6.5D.3.3.3 Minimum conformance requirements

The additional spurious emission requirements specified in 6.5.3.3.3 apply to each UE antenna connector.

The normative reference for this requirement is TS 38.101-1 [2] clauses 6.5D.3 and 6.5.3.3

6.5D.3.3.4 Test description

6.5D.3.3.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, test channel bandwidths and sub-carrier spacing based on NR operating bands specified in Table 5.3.5-1. All these configurations shall be tested with applicable test parameters for each combination of channel bandwidth and sub-carrier spacing, and are shown in Table 6.5D.3.3.4.1-1 through Table 6.5D.3.3.4.1-4. The details of the uplink reference measurement channels (RMCs) are specified in Annex A.2.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Table 6.5D.3.3.4.1-1: Test Configuration Table (network signalling value "NS\_04")

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Initial Conditions | | | | | | | |
| Test Environment as specified in TS 38.508-1 [5] subclause 4.1 | | | | | | Normal | |
| Test Frequencies as specified in TS 38.508-1 [5] subclause 4.3.1 | | | | | | (See Freq column) | |
| Test Channel Bandwidths as specified in TS 38.508-1 [5] subclause 4.3.1 | | | | | | Lowest, Highest | |
| Test SCS as specified in Table 5.3.5-1 | | | | | | Lowest | |
| Additional spurious emissions test parameters for NS\_04 | | | | | | | |
|  |  |  |  | Downlink Configuration | Uplink Configuration | | |
| Test ID | Freq | | | N/A for A-MPR testing | Modulation | | RB allocation (NOTE 1) |
| (NOTE 2) | |
| 1 | Low | | |  | CP-OFDM QPSK | | Edge\_1RB\_Left |
| 2 | Table 6.2.3.4.1-2a - Table 6.2.3.4.1-2c | | |  | CP-OFDM QPSK | | Edge\_1RB\_Left |
| 3 | Table 6.2.3.4.1-2d - Table 6.2.3.4.1-2f | | |  | CP-OFDM QPSK | | Edge\_1RB\_Left |
| 4 | Low | | |  | CP-OFDM QPSK | | Outer Full |
| 5 | High | | |  | CP-OFDM QPSK | | Edge\_1RB\_Right |
| 6 | High | | |  | CP-OFDM QPSK | | Outer Full |
| 7 | Low | | |  | CP-OFDM 16 QAM | | Edge\_1RB\_Left |
| 8 | Table 6.2.3.4.1-2a - Table 6.2.3.4.1-2c | | |  | CP-OFDM 16 QAM | | Edge\_1RB\_Left |
| 9 | Table 6.2.3.4.1-2d - Table 6.2.3.4.1-2f | | |  | CP-OFDM 16 QAM | | Edge\_1RB\_Left |
| 10 | Low | | |  | CP-OFDM 16 QAM | | Outer Full |
| 11 | High | | |  | CP-OFDM 16 QAM | | Edge\_1RB\_Right |
| 12 | High | | |  | CP-OFDM 16 QAM | | Outer Full |
| 13 | Low | | |  | CP-OFDM 64 QAM | | Edge\_1RB\_Left |
| 14 | Table 6.2.3.4.1-2a - Table 6.2.3.4.1-2c | | |  | CP-OFDM 64 QAM | | Edge\_1RB\_Left |
| 15 | Table 6.2.3.4.1-2d - Table 6.2.3.4.1-2f | | |  | CP-OFDM 64 QAM | | Edge\_1RB\_Left |
| 16 | Low | | |  | CP-OFDM 64 QAM | | Outer Full |
| 17 | High | | |  | CP-OFDM 64 QAM | | Edge\_1RB\_Right |
| 18 | High | | |  | CP-OFDM 64 QAM | | Outer Full |
| 19 | Low | | |  | CP-OFDM 256 QAM | | Edge\_1RB\_Left |
| 20 | Table 6.2.3.4.1-2a - Table 6.2.3.4.1-2c | | |  | CP-OFDM 256 QAM | | Edge\_1RB\_Left |
| 21 | Table 6.2.3.4.1-2d - Table 6.2.3.4.1-2f | | |  | CP-OFDM 256 QAM | | Edge\_1RB\_Left |
| 22 | Low | | |  | CP-OFDM 256 QAM | | Outer Full |
| 23 | High | | |  | CP-OFDM 256 QAM | | Edge\_1RB\_Right |
| 24 | High | | |  | CP-OFDM 256 QAM | | Outer Full |
| NOTE 1: The specific configuration of each RB allocation is defined in Table 6.1-1. | | | | | | | |

Table 6.5D.3.3.4.1-2: Test Configuration table for NS\_47 power class 3 (contiguous allocation)

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Initial Conditions | | | | | | | | | | |
| Test Environment as specified in TS 38.508-1 [5] subclause 4.1 | | | | | | | | Normal | | |
| Test Frequencies | | | | | | | | As specified in Table 6.2.3.4.1-19 and 6.2.3.4.1-20 | | |
| Test Channel Bandwidths as specified in TS 38.508-1 [5] subclause 4.3.1 | | | | | | | | 30 MHz | | |
| Test SCS as specified in Table 5.3.5-1 | | | | | | | | Lowest | | |
| A-MPR test parameters for NS\_47 | | | | | | | | | | |
| Test ID | Fc (MHz) | Ch BW (MHz) | SCS (kHz) | Downlink Configuration | Uplink Configuration | | | | | |
| Modulation  (Note 2) | | RB allocation (Note 1) | | | |
| SCS 15 kHz | | SCS 30 kHz | SCS 60 kHz |
| 43 | Default | 30 | Default | CP-OFDM | QPSK | Edge\_1RB\_Left (A1) | | | |
| 44 | Default | 30 | Default | QPSK | 1@29 (A2) | | 1@15 (A2) | 1@8 (A2) |
| 45 | Default | 30 | Default | QPSK | Edge\_1RB\_Right (A3) | | | |
| 46 | Default | 30 | Default | QPSK | Outer\_Full (A2) | | | |
| 47 | Default | 30 | Default | QPSK | 108@0 (A4) | | 54@0 (A4) | 27@0 (A4) |
| 48 | Default | 30 | Default | QPSK | 80@0 (A4) | | 40@0 (A4) | 20@0 (A4) |
| 49 | Default | 30 | Default | QPSK | 54@0 (A2) | | 27@0 (A2) | 12@0 (A2) |
| 50 | Default | 30 | Default | 16 QAM | Edge\_1RB\_Left (A1) | | | |
| 51 | Default | 30 | Default | 16 QAM | 1@29 (A2) | | 1@15 (A2) | 1@8 (A2) |
| 52 | Default | 30 | Default | 16 QAM | Edge\_1RB\_Right (A3) | | | |
| 53 | Default | 30 | Default | 16 QAM | Outer\_Full (A2) | | | |
| 54 | Default | 30 | Default | 16 QAM | 108@0 (A4) | | 54@0 (A4) | 27@0 (A4) |
| 55 | Default | 30 | Default | 16 QAM | 80@0 (A4) | | 40@0 (A4) | 20@0 (A4) |
| 56 | Default | 30 | Default | 16 QAM | 54@0 (A2) | | 27@0 (A2) | 12@0 (A2) |
| 57 | Default | 30 | Default | 64 QAM | Edge\_1RB\_Left (A1) | | | |
| 58 | Default | 30 | Default | 64 QAM | 1@29 (A2) | | 1@15 (A2) | 1@8 (A2) |
| 59 | Default | 30 | Default | 64 QAM | Edge\_1RB\_Right (A3) | | | |
| 60 | Default | 30 | Default | 64 QAM | Outer\_Full (A2) | | | |
| 61 | Default | 30 | Default | 64 QAM | 108@0 (A4) | | 54@0 (A4) | 27@0 (A4) |
| 62 | Default | 30 | Default | 64 QAM | 80@0 (A4) | | 40@0 (A4) | 20@0 (A4) |
| 63 | Default | 30 | Default | 64 QAM | 54@0 (A2) | | 27@0 (A2) | 12@0 (A2) |
| 64 | Default | 30 | Default | 256 QAM | Edge\_1RB\_Left (A1) | | | |
| 65 | Default | 30 | Default | 256 QAM | 1@29 (A2) | | 1@15 (A2) | 1@8 (A2) |
| 66 | Default | 30 | Default | 256 QAM | Edge\_1RB\_Right (A3) | | | |
| 67 | Default | 30 | Default | 256 QAM | Outer\_Full (A2) | | | |
| 68 | Default | 30 | Default | 256 QAM | 108@0 (A4) | | 54@0 (A4) | 27@0 (A4) |
| 69 | Default | 30 | Default | 256 QAM | 80@0 (A4) | | 40@0 (A4) | 20@0 (A4) |
| 70 | Default | 30 | Default | 256 QAM | 54@0 (A2) | | 27@0 (A2) | 12@0 (A2) |
| NOTE 1: The specific configuration of each RB allocation is defined in Table 6.1-1 unless otherwise stated in this table.  NOTE 2: DFT-s-OFDM PI/2 BPSK test applies only for UEs which supports half Pi BPSK in FR1.  NOTE 3: UE operating in TDD mode with Pi/2 BPSK modulation and UE indicates support for UE capability *powerBoosting-pi2BPSK* and the IE *powerBoostPi2BPSK* is set to 1 for bands n41.  NOTE 4: UE operating in FDD mode, or in TDD mode in bands other than n41, or in TDD mode the IE *powerBoostPi2BPSK* is set to 0 for bands n41.  NOTE 5: Void | | | | | | | | | | |

Table 6.5D.3.3.4.1-3: Test Configuration table for NS\_47 power class 3 (almost contiguous allocation)

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Initial Conditions | | | | | | | |
| Test Environment as specified in TS 38.508-1 [5] subclause 4.1 | | | | | | | Normal |
| Test Frequencies | | | | | | | As specified in Table 6.2.3.4.1-19 and 6.2.3.4.1-20 |
| Test Channel Bandwidths as specified in TS 38.508-1 [5] subclause 4.3.1 | | | | | | | 30 MHz |
| Test SCS as specified in Table 5.3.5-1 | | | | | | | Lowest |
| A-MPR test parameters for NS\_47 | | | | | | | |
| Test ID | Fc (MHz) | Ch BW (MHz) | SCS (kHz) | Downlink Configuration | Uplink Configuration | | |
| Modulation | | RB allocation (Note 1) |
| 1 | Default | 30 | Default | CP-OFDM | QPSK | Outer\_Full (A2) |
| 2 | Default | 30 | Default | 16 QAM | Outer\_Full (A2) |
| 3 | Default | 30 | Default | 64 QAM | Outer\_Full (A2) |
| 4 | Default | 30 | Default | 256 QAM | Outer\_Full (A2) |
| NOTE 1: The specific configuration of each RB allocation is defined in Table 6.2.2.4.1-4.  NOTE 2: Void. | | | | | | | |

Table 6.5D.3.3.4.1-4: Test Configuration table for NS\_47 power class 2 (contiguous allocation)

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Initial Conditions | | | | | | | | | | |
| Test Environment as specified in TS 38.508-1 [5] subclause 4.1 | | | | | | | | Normal | | |
| Test Frequencies | | | | | | | | As specified in Table 6.2.3.4.1-19 and 6.2.3.4.1-20 | | |
| Test Channel Bandwidths as specified in TS 38.508-1 [5] subclause 4.3.1 | | | | | | | | 30 MHz | | |
| Test SCS as specified in Table 5.3.5-1 | | | | | | | | Lowest | | |
| A-MPR test parameters for NS\_47 | | | | | | | | | | |
| Test ID | Fc (MHz) | Ch BW (MHz) | SCS (kHz) | Downlink Configuration | Uplink Configuration | | | | | |
| Modulation  (Note 2) | | RB allocation (Note 1) | | | |
| SCS 15 kHz | | SCS 30 kHz | SCS 60 kHz |
| 36 | Default | 30 | Default | CP-OFDM | QPSK | Edge\_1RB\_Left (A1) | | | |
| 37 | Default | 30 | Default | QPSK | 1@29 (A2) | | 1@15 (A2) | 1@8 (A2) |
| 38 | Default | 30 | Default | QPSK | Edge\_1RB\_Right (A3) | | | |
| 39 | Default | 30 | Default | QPSK | Outer\_Full (A2) | | | |
| 40 | Default | 30 | Default | QPSK | 108@0 (A4) | | 54@0 (A4) | 27@0 (A4) |
| 41 | Default | 30 | Default | QPSK | 80@0 (A4) | | 40@0 (A4) | 20@0 (A4) |
| 42 | Default | 30 | Default | QPSK | 54@0 (A2) | | 27@0 (A2) | 12@0 (A2) |
| 43 | Default | 30 | Default | 16 QAM | Edge\_1RB\_Left (A1) | | | |
| 44 | Default | 30 | Default | 16 QAM | 1@29 (A2) | | 1@15 (A2) | 1@8 (A2) |
| 45 | Default | 30 | Default | 16 QAM | Edge\_1RB\_Right (A3) | | | |
| 46 | Default | 30 | Default | 16 QAM | Outer\_Full (A2) | | | |
| 47 | Default | 30 | Default | 16 QAM | 108@0 (A4) | | 54@0 (A4) | 27@0 (A4) |
| 48 | Default | 30 | Default | 16 QAM | 80@0 (A4) | | 40@0 (A4) | 20@0 (A4) |
| 49 | Default | 30 | Default | 16 QAM | 54@0 (A2) | | 27@0 (A2) | 12@0 (A2) |
| 50 | Default | 30 | Default | 64 QAM | Edge\_1RB\_Left (A1) | | | |
| 51 | Default | 30 | Default | 64 QAM | 1@29 (A2) | | 1@15 (A2) | 1@8 (A2) |
| 52 | Default | 30 | Default | 64 QAM | Edge\_1RB\_Right (A3) | | | |
| 53 | Default | 30 | Default | 64 QAM | Outer\_Full (A2) | | | |
| 54 | Default | 30 | Default | 64 QAM | 108@0 (A4) | | 54@0 (A4) | 27@0 (A4) |
| 55 | Default | 30 | Default | 64 QAM | 80@0 (A4) | | 40@0 (A4) | 20@0 (A4) |
| 56 | Default | 30 | Default | 64 QAM | 54@0 (A2) | | 27@0 (A2) | 12@0 (A2) |
| 57 | Default | 30 | Default | 256 QAM | Edge\_1RB\_Left (A1) | | | |
| 58 | Default | 30 | Default | 256 QAM | 1@29 (A2) | | 1@15 (A2) | 1@8 (A2) |
| 59 | Default | 30 | Default | 256 QAM | Edge\_1RB\_Right (A3) | | | |
| 60 | Default | 30 | Default | 256 QAM | Outer\_Full (A2) | | | |
| 61 | Default | 30 | Default | 256 QAM | 108@0 (A4) | | 54@0 (A4) | 27@0 (A4) |
| 62 | Default | 30 | Default | 256 QAM | 80@0 (A4) | | 40@0 (A4) | 20@0 (A4) |
| 63 | Default | 30 | Default | 256 QAM | 54@0 (A2) | | 27@0 (A2) | 12@0 (A2) |
| NOTE 1: The specific configuration of each RB allocation is defined in Table 6.1-1 unless otherwise stated in this table.  NOTE 2: DFT-s-OFDM PI/2 BPSK test applies only for UEs which supports half Pi BPSK in FR1.  NOTE 3: Void | | | | | | | | | | |

Table 6.5D.3.3.4.1-5: Test Configuration table for NS\_21

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Initial Conditions | | | | | | | | |
| Test Environment as specified in TS 38.508-1 [5] subclause 4.1 | | | | | | | Normal | |
| Test Frequencies as specified in TS 38.508-1 [5] subclause 4.3.1 | | | | | | | Low range, High range | |
| Test Channel Bandwidths as specified in TS 38.508-1 [5] subclause 4.3.1 | | | | | | | Lowest, Highest | |
| Test SCS as specified in Table 5.3.5-1 | | | | | | | Lowest | |
| A-MPR test parameters for NS\_21 | | | | | | | | |
| Test ID | Freq | ChBw | SCS | Downlink Configuration | Uplink Configuration | | | |
| Modulation  (Note 2) | | RB allocation (Note 1) | |
| SCS 15 kHz | SCS 30 kHz |
|  |  |  |  | N/A for A-MPR test cases |  |  |  | |
| 26 | Low | Default | Default | CP-s OFDM | QPSK | Edge\_1RB\_Left | |
| 27 | High | Default | Default | QPSK | Edge\_1RB\_Right | |
| 28 | Default | Default | Default | QPSK | Outer\_Full | |
| 29 | Default | 10 MHz | Default | QPSK | 4@0 | 2@0 |
| 30 | Default | 10 MHz | Default | QPSK | 4@48 | 2@22 |
| 31 | Low | Default | Default | 16 QAM | Edge\_1RB\_Left | |
| 32 | High | Default | Default | 16 QAM | Edge\_1RB\_Right | |
| 33 | Default | Default | Default | 16 QAM | Outer\_Full | |
| 34 | Default | 10 MHz | Default | 16 QAM | 4@0 | 2@0 |
| 35 | Default | 10 MHz | Default | 16 QAM | 4@48 | 2@22 |
| 36 | Low | Default | Default | 64 QAM | Edge\_1RB\_Left | |
| 37 | High | Default | Default | 64 QAM | Edge\_1RB\_Right | |
| 38 | Default | Default | Default | 64 QAM | Outer\_Full | |
| 39 | Default | 10 MHz | Default | 64 QAM | 4@0 | 2@0 |
| 40 | Default | 10 MHz | Default | 64 QAM | 4@48 | 2@22 |
| 41 | Low | Default | Default | 256 QAM | Edge\_1RB\_Left | |
| 42 | High | Default | Default | 256 QAM | Edge\_1RB\_Right | |
| 43 | Default | Default | Default | 256 QAM | Outer\_Full | |
| 44 | Default | 10 MHz | Default | 256 QAM | 4@0 | 2@0 |
| 45 | Default | 10 MHz | Default | 256 QAM | 4@48 | 2@22 |
| NOTE 1: The specific configuration of each RB allocation is defined in Table 6.1-1 unless otherwise stated in this table.  NOTE 2: DFT-s-OFDM PI/2 BPSK test applies only for UEs which supports half Pi BPSK in FR1. | | | | | | | | |

1. Connect the SS to the UE to the UE antenna connectors as shown in TS 38.508-1 [5] Annex A Figure A.3.1.2.2 for TE diagram and section A.3.2 for UE diagram.

2. The parameter settings for the cell are set up according to TS 38.508-1 [5] subclause 4.4.3.

3. Downlink signals are initially set up according to Annex C.0, C.1, C.2, and uplink signals according to Annex G.0, G.1, G.2, G.3.0.

4. The UL Reference Measurement channels are set according to Table 6.5D.3.3.4.1-1 for NS\_04 and to Table 6.5D.3.3.4.1-2 to 6.5D.3.3.4.1-4 for NS\_47.

5. Propagation conditions are set according to Annex B.0.

6. Ensure the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On,* Test Mode *On* and Test Loop Function *On* according to TS 38.508-1 [5] clause 4.5. Message contents are defined in clause 6.5D.3.3.4.3.

6.5D.3.3.4.2 Test procedure

1 SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0\_1 for C\_RNTI to schedule the UL RMC according to Table 6.5D.3.3.4.1-1 as appropriate for NS\_04. Since the UE has no payload data to send, the UE transmits uplink MAC padding bits on the UL RMC. The PDCCH DCI format 0\_1 is specified with condition 2TX\_UL\_MIMO in 38.508-1 [5] subclause 4.3.6.1.1.2.

2. Send continuously uplink power control "up" commands in the uplink scheduling information to the UE until the UE transmits at PUMAX level.

3. Measure the sum of the mean power at each UE antenna connector in the channel bandwidth of the radio access mode, which shall meet the requirements described in Clauses from 6.2D.2.5, or 6.2D.3.5 as appropriate for NS\_04 and NS\_47. The period of measurement shall be at least the continuous duration of 1ms over consecutive active uplink slots and uplink symbols. For TDD, only slots consisting of only UL symbols are under test.

4. Measure the power of the transmitted signal at each UE antenna connector with a measurement filter of bandwidths according to Tables 6.5.3.3.5.1-1 as appropriate for NS\_04, Table 6.5.3.3.3.151 as appropriate for NS\_47, and Table 6.5.3.3.3.12-1 as appropriate for NS\_21. The centre frequency of the filter shall be stepped in contiguous steps according to the same table the measured power shall be verified for each step. The measurement period shall capture the active time slots. During measurement the spectrum analyser shall be set to 'Detector' = RMS. If the sweep count is higher than one, the trace mode shall be average.

6.5D.3.3.4.3 Message contents

Message contents are according to TS 38.508-1 [5] subclause 4.6 ensuring Table 4.6.3-182 with condition 2TX\_UL\_MIMO and same exceptions listed in clause 6.5.3.3.4.3

6.5D.3.3.5 Test requirement

The measured power at each UE antenna connector derived in step 4 shall meet the requirements for the specified NR band for an additional spurious emission requirement with protected bands as indicated in clause 6.5.3.3.5 for different NS values.

NOTE: For measurement conditions at the edge of each frequency range, the lowest frequency of the measurement position in each frequency range should be set at the lowest boundary of the frequency range plus MBW/2. The highest frequency of the measurement position in each frequency range should be set at the highest boundary of the frequency range minus MBW/2. MBW denotes the measurement bandwidth defined for the protected band.

### 6.5D.3\_1 Spurious emissions for UL MIMO (Rel-16 onward)

#### 6.5D.3\_1.1 General spurious emissions for UL MIMO (Rel-16 onward)

6.5D.3\_1.1.1 Test purpose

To verify that UE transmitter does not cause unacceptable interference to other channels or other systems in terms of transmitter spurious emissions.

6.5D.3\_1.1.2 Test applicability

This test case applies to all types of NR Power Class 1.5, Power Class 2 and Power Class 3 UE release 16 and forward that support 2-layer codebook based UL MIMO.

6.5D.3\_1.1.3 Minimum conformance requirements

For UE supporting UL MIMO, the requirements for spurious emissions which are caused by unwanted transmitter effects such as harmonics emission, parasitic emissions, intermodulation products and frequency conversion products is defined as the sum of the emissions from both UE transmit antenna connectors.

The general spurious emission requirements specified in clause 6.5.3.1.3 apply. For UEs with two transmit antenna connectors in closed-loop spatial multiplexing scheme, the requirements shall be met with the UL MIMO configurations described in clause 6.2D.1. For UEs supporting ULFPTx for UL MIMO, the requirements shall be met with the PUSCH configurations specified in Table 6.2D.1.3-3, based upon UE’s support of uplink full power transmission mode.

If UE is scheduled for single antenna-port PUSCH transmission by DCI format 0\_0 or by DCI format 0\_1 for single antenna port codebook based transmission, the requirements in clause 6.5.3 apply.

The normative reference for this requirement is TS 38.101-1 [2] subclauses 6.5D.3 and 6.5.3.1.

6.5D.3\_1.1.4 Test description

6.5D.3\_1.1.4.1 Initial conditions

Same initial conditions as in clause 6.5D.3.1.4.1.

6.5D.3\_1.1.4.2 Test procedure

1. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0\_1 for C\_RNTI to schedule the UL RMC according to Table 6.5D.3.1.4.1-1. Since the UE has no payload data to send, the UE transmits uplink MAC padding bits on the UL RMC. The PDCCH DCI format 0\_1 is specified with condition 2TX\_UL\_MIMO in 38.508-1 [5] subclause 4.3.6.1.1.2.

2. Send continuously uplink power control "up" commands in the uplink scheduling information to the UE until the UE transmits at PUMAX level.

3. Measure the sum of transmitted power at each antenna connector with a measurement filter of bandwidths according to table 6.5D.3\_1.1.5-1. The centre frequency of the filter shall be stepped in contiguous steps according to table 6.5D.3\_1.1.5-1. The measured power shall be verified for each step. The measurement period shall capture the active time slots. During measurement the spectrum analyser shall be set to 'Detector' = RMS. If the sweep count is higher than one, the trace mode shall be average.

4. If UE supports ULFPTx Mode-2 or Mode-full power, repeat test steps 1~3 with the exception that the PDCCH DCI format 0\_1 is specified with the condition ULFPTx\_Mode2 or ULFPTx\_ModeFull in 38.508-1 [5] subclause 4.3.6.1.1.2 depending on UE reported capability.

6.5D.3\_1.1.4.3 Message contents

Message contents are according to TS 38.508-1 [5] subclause 4.6 and 5.4 ensuring Table 4.6.3-182 with the condition 2TX\_UL\_MIMO.

6.5D.3\_1.1.5 Test requirement

The measured average power of spurious emission, derived in step 3 or step 4, shall not exceed the described value in Table 6.5D.3\_1.1.5-1.

The spurious emission limits apply for the frequency ranges that are more than ΔfOOB (MHz) in Table 6.5.3.1.3-1from the edge of the channel bandwidth.

Table 6.5D.3\_1.1.5-1: General spurious emissions test requirements

|  |  |  |  |
| --- | --- | --- | --- |
| Frequency Range | Maximum Level | Measurement bandwidth | NOTE |
| 9 kHz ≤ f < 150 kHz | -36 dBm | 1 kHz |  |
| 150 kHz ≤ f < 30 MHz | -36 dBm | 10 kHz |  |
| 30 MHz ≤ f < 1000 MHz | -36 dBm | 100 kHz |  |
| 1 GHz ≤ f < 12.75 GHz | -30 dBm | 1 MHz |  |
| 12.75 GHz ≤ f < 5th harmonic of the upper frequency edge of the UL operating band in GHz | -30 dBm | 1 MHz | 1 |
| 12.75 GHz < f < 26 GHz | -30 dBm | 1 MHz | 2 |
| NOTE 1: Applies for Band that the upper frequency edge of the UL Band more than 2.69 GHz  NOTE 2: Applies for Band that the upper frequency edge of the UL Band more than 5.2 GHz | | | |

#### 6.5D.3\_1.2 Spurious emission for UE co-existence for UL MIMO (Rel-16 onward)

6.5D.3\_1.2.1 Test purpose

To verify that UE transmitter does not cause unacceptable interference to co-existing systems for the specified bands which has specific requirements in terms of transmitter spurious emissions.

6.5D.3\_1.2.2 Test applicability

This test case applies to all types of NR Power Class 1.5, Power Class 2 and Power Class 3 UE release 16 and forward that support 2-layer codebook based UL MIMO.

6.5D.3\_1.2.3 Minimum conformance requirements

For UE supporting UL MIMO, the requirements for Spurious emissions which are caused by unwanted transmitter effects such as harmonics emission, parasitic emissions, intermodulation products and frequency conversion products is defined as the sum of the emissions from both UE transmit antenna connectors.

The spurious emission for UE co-existence requirements specified in clause 6.5.3.2.3 apply. For UEs with two transmit antenna connectors in closed-loop spatial multiplexing scheme, the requirements shall be met with the UL MIMO configurations described in clause 6.2D.1. For UEs supporting ULFPTx for UL MIMO, the requirements shall be met with the PUSCH configurations specified in Table 6.2D.1.3-3, based upon UE’s support of uplink full power transmission mode.

The normative reference for this requirement is TS 38.101-1 [2] subclauses 6.5.3.2 and 6.5D.3.

6.5D.3\_1.2.4 Test description

6.5D.3\_1.2.4.1 Initial conditions

Same initial conditions as in clause 6.5D.3.2.4.1.

6.5D.3\_1.2.4.2 Test procedure

1 SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0\_1 for C\_RNTI to schedule the UL RMC according to Table 6.5D.3.2.4.1-1. Since the UE has no payload data to send, the UE transmits uplink MAC padding bits on the UL RMC. The PDCCH DCI format 0\_1 is specified with condition 2TX\_UL\_MIMO in 38.508-1 [5] subclause 4.3.6.1.1.2.

2. Send continuously uplink power control "up" commands in the uplink scheduling information to the UE until the UE transmits at PUMAX level.

3. Measure the sum of transmitted power at each UE antenna connector with a measurement filter of bandwidths according to table 6.5.3.2.3-1. The centre frequency of the filter shall be stepped in contiguous steps according to table 6.5.3.2.3-1. The measured power shall be verified for each step. The measurement period shall capture the active time slots. During measurement the spectrum analyser shall be set to 'Detector' = RMS. If the sweep count is higher than one, the trace mode shall be average.

4. If UE supports ULFPTx Mode-2 or Mode-full power, repeat test steps 1~3 with the exception that the PDCCH DCI format 0\_1 is specified with the condition ULFPTx\_Mode2 or ULFPTx\_ModeFull in 38.508-1 [5] subclause 4.3.6.1.1.2 depending on UE reported capability.

6.5D.3\_1.2.4.3 Message contents

Message contents are according to TS 38.508-1 [5] subclause 4.6 and 5.4 ensuring Table 4.6.3-182 with the condition 2TX\_UL\_MIMO.

6.5D.3\_1.2.5 Test requirement

The measured average power of spurious emission, derived in step 3 or step 4 from both UE antenna connectors, shall not exceed the described value in Table 6.5.3.2.3-1.

#### 6.5D.3\_1.3 Additional spurious emissions for UL MIMO (Rel-16 onward)

6.5D.3\_1.3.1 Test purpose

To verify that UE transmitter does not cause unacceptable interference to other channels or other systems in terms of transmitter spurious emissions under the deployment scenarios where additional requirements are specified.

6.5D.3\_1.3.2 Test applicability

This test case applies to all types of NR Power Class 1.5, Power Class 2 and Power Class 3 UE release 16 and forward that support 2-layer codebook based UL MIMO.

6.5D.3\_1.3.3 Minimum conformance requirements

For UE supporting UL MIMO, the requirements for Spurious emissions which are caused by unwanted transmitter effects such as harmonics emission, parasitic emissions, intermodulation products and frequency conversion products is defined as the sum of the emissions from both UE transmit antenna connectors.

The additional spurious emission requirements specified in clause 6.5.3.3.3 apply. For UEs with two transmit antenna connectors in closed-loop spatial multiplexing scheme, the requirements shall be met with the UL MIMO configurations described in clause 6.2D.1. For UEs supporting ULFPTx for UL MIMO, the requirements shall be met with the PUSCH configurations specified in Table 6.2D.1.3-3, based upon UE’s support of uplink full power transmission mode.

The normative reference for this requirement is TS 38.101-1 [2] clauses 6.5D.3 and 6.5.3.3

6.5D.3\_1.3.4 Test description

6.5D.3\_1.3.4.1 Initial conditions

Same initial conditions as in clause 6.5D.3.3.4.1 together with tables 6.5D.3\_1.3.4-1 to 6.5D.3\_1.3.4-3.

Table 6.5D.3\_1.3.4.1-1: Test Configuration table for NS\_05

Same test configuration as listed in Table 6.2.3.4.1-4 shall be used with the following exceptions:

- Test SCS shall be: [Lowest].

- Only Test IDs 66 to 115 shall be tested.

Table 6.5D.3\_1.3.4.1-2: Test Configuration table for NS\_48

Same test configuration as listed in Table 6.2.3.4.1-19 shall be used with the following exceptions:

- Test Channel Bandwidths shall be: 25, 30, 40, 45 and 50 MHz

- Test SCS shall be: Lowest.

- Only Test IDs 41 to 80 shall be tested.

Table 6.5D.3\_1.3.4.1-3: Test Configuration table for NS\_49

Same test configuration as listed in Table 6.2.3.4.1-29 shall be used with the following exceptions:

- Test Channel Bandwidths shall be: 25, 30, 40, 45 and 50 MHz

- Test SCS shall be: Lowest.

- Only Test IDs 53 to 104 shall be tested.

Table 6.5D.3\_1.3.4.1-4: Test Configuration table for NS\_46

Same test configuration as listed in Table 6.2.3.4.1-25 shall be used with the following exceptions:

- Test SCS shall be: Lowest.

- Only Test IDs 11 to 22 shall be tested.

Table 6.5D.3\_1.3.4.1-5: Test Configuration table for NS\_21

Same test configuration as listed in Table 6.2.3.4.1-27 shall be used with the following exceptions:

- Test SCS shall be: Lowest.

- Only Test IDs 26 to 45 shall be tested.

Table 6.5D.3\_1.3.4.1-6: Test Configuration table for NS\_44

Same test configuration as listed in Table 6.2.3.4.1-26 shall be used with the following exceptions:

- Test SCS shall be: Lowest.

- Only Test IDs 23 to 44 shall be tested.

Table 6.5D.3\_1.3.4.1-7: Test Configuration table for NS\_27

Same test configuration as listed in Table 6.2.3.4.1-13 shall be used with the following exceptions:

- Test SCS shall be: Lowest.

- Only Test IDs 141 to 252 shall be tested.

Table 6.5D.3\_1.3.4.1-8: Test Configuration table for NS\_50

Same test configuration as listed in Table 6.2.3.4.1-33 shall be used with the following exceptions:

- Test SCS shall be: Lowest.

- Only Test IDs 23 to 44 shall be tested.

6.5D.3\_1.3.4.2 Test procedure

1 SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0\_1 for C\_RNTI to schedule the UL RMC according to tables in clause 6.5D.3\_1.3.4.1 as appropriate. Since the UE has no payload data to send, the UE transmits uplink MAC padding bits on the UL RMC. The PDCCH DCI format 0\_1 is specified with condition 2TX\_UL\_MIMO in 38.508-1 [5] subclause 4.3.6.1.1.2.

2. Send continuously uplink power control "up" commands in the uplink scheduling information to the UE until the UE transmits at PUMAX level.

3. Measure the sum of the mean power at each UE antenna connector in the channel bandwidth of the radio access mode according to the test configurations in clause 6.5D.3\_1.3.4.1, which shall meet the requirements described in clauses 6.2D.3.5 as appropriate for each network signalling. The period of measurement shall be at least the continuous duration of 1ms over consecutive active uplink slots and uplink symbols. For TDD, only slots consisting of only UL symbols are under test.

4. Measure the sum of transmitted power at each UE antenna connector with a measurement filter of bandwidths according to clauses 6.5.3.3.3.1 to 6.5.3.3.3.25 as appropriate. The centre frequency of the filter shall be stepped in contiguous steps according to the same table the measured power shall be verified for each step. The measurement period shall capture the active time slots. During measurement the spectrum analyser shall be set to 'Detector' = RMS. If the sweep count is higher than one, the trace mode shall be average.

5. If UE supports ULFPTx Mode-2 or Mode-full power, repeat test steps 1~4 with the exception that the PDCCH DCI format 0\_1 is specified with the condition ULFPTx\_Mode2 or ULFPTx\_ModeFull in 38.508-1 [5] subclause 4.3.6.1.1.2 depending on UE reported capability.

6.5D.3\_1.3.4.3 Message contents

Message contents are according to TS 38.508-1 [5] subclause 4.6 and 5.4 ensuring Table 4.6.3-182 with condition 2TX\_UL\_MIMO and same exceptions listed in clause 6.5.3.3.4.3.

6.5D.3\_1.3.5 Test requirement

The measured power from both UE antenna connector derived in step 4 or step 5 shall meet the requirements for the specified NR band for an additional spectrum emission requirement with protected bands as indicated in clause 6.5.3.3.5.

NOTE: For measurement conditions at the edge of each frequency range, the lowest frequency of the measurement position in each frequency range should be set at the lowest boundary of the frequency range plus MBW/2. The highest frequency of the measurement position in each frequency range should be set at the highest boundary of the frequency range minus MBW/2. MBW denotes the measurement bandwidth defined for the protected band.

### 6.5D.3\_2 Spurious emissions for SUL with UL MIMO

#### 6.5D.3\_2.1 General spurious emissions for SUL with UL MIMO

6.5D.3\_2.1.1 Test purpose

To verify that UE transmitter does not cause unacceptable interference to other channels or other systems in terms of transmitter spurious emissions.

6.5D.3\_2.1.2 Test applicability

This test case applies to all types of NR UE release 17 and forward that support SUL and UL MIMO operating on the SUL bands.

6.5D.3\_2.1.3 Minimum conformance requirements

For a terminal that supports SUL for the band combination specified in Table 5.2C-1, the current version of the specification assumes the terminal is configured with active transmission either on UL carrier or SUL carrier at any time in one serving cell and the UE requirements for single carrier shall apply for the active UL or SUL carrier accordingly.

For UE supporting UL MIMO, the requirements for spurious emissions which are caused by unwanted transmitter effects such as harmonics emission, parasitic emissions, intermodulation products and frequency conversion products is defined as the sum of the emissions from both UE transmit antenna connectors.

The normative reference for this requirement is TS 38.101-1 [2] subclauses 6.5D.3 and 6.5.3.1.

6.5D.3\_2.1.4 Test description

6.5D.3\_2.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, test channel bandwidths and sub-carrier spacing based on NR operating bands specified in Table 5.5C-1. All of these configurations shall be tested with applicable test parameters for each combination of channel bandwidth and sub-carrier spacing, are shown in table 6.5D.3\_2.1.4.1-1. The details of the uplink reference measurement channels (RMCs) are specified in Annexes A.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Table 6.5D.3\_2.1.4-1: Test Configuration Table

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Initial Conditions | | | | | |
| Test Environment as specified in TS 38.508-1 [5] subclause 4.1 | | | Normal | | |
| Test Frequencies as specified in TS 38.508-1 [5] subclause 4.3.1 | | | Low range, Mid range, High range for SUL carrier  Mid range for Non-SUL carrier | | |
| Test Channel Bandwidths as specified in TS 38.508-1 [5] subclause 4.3.1 | | | Lowest, Mid, Highest for SUL carrier  Lowest for Non-SUL carrier | | |
| Test SCS as specified in Table 5.3.5-1 | | | 15kHz for SUL carrier and Lowest supported SCS for Non-SUL carrier | | |
| Test Parameters for Channel Bandwidths | | | | | |
| Test ID | Downlink Configuration | UL Configuration | | SUL Configuration | |
|  | N/A | N/A | | Modulation | RB allocation (NOTE 2) |
| 1 |  |  | | CP-OFDM QPSK | OuterFull |
| 2 |  |  | | CP-OFDM QPSK | Edge\_1RB\_Left |
| 3 |  |  | | CP-OFDM QPSK | Edge\_1RB\_Right |
| NOTE 1: Test Channel Bandwidths are checked separately for each SUL band combination, the applicable channel bandwidths are specified in Table 5.5C-1.  NOTE 2: The specific configuration of each RB allocation is defined in Table 6.1-1.  NOTE 3: Void | | | | | |

1. Connect the SS to the UE antenna connectors as shown in TS 38.508-1 [5] Annex [A, Figure A.3.1.2.2 for TE diagram and section A.3.2 for UE diagram.

2. The parameter settings for the cell are set up according to TS 38.508-1 [5] subclause 4.4.3.

3. Downlink signals are initially set up according to Annex C.0, C.1 and C.2, and uplink signals according to Annex G.0, G.1, G.2, and G.3.0 with consideration of supplementary uplink physical channels.

4. The UL Reference Measurement channels are set according to Table 6.5D.3\_2.1.4.1-1.

5. Propagation conditions are set according to Annex B.0.

6. Ensure the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On,* Test Mode *On* and Test Loop Function *On* according to TS 38.508-1 [5] clause 4.5. Message contents are defined in clause 6.5D.3\_2.1.4.3.

6.5D.3\_2.1.4.2 Test procedure

1. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0\_1 for C\_RNTI to schedule the UL RMC according to Table 6.5D.3\_2.1.4.1-1. Since the UE has no payload data to send, the UE transmits uplink MAC padding bits on the UL RMC. The PDCCH DCI format 0\_1 is specified with condition 2TX\_UL\_MIMO in 38.508-1 [5] subclause 4.3.6.1.1.2.

2. Send continuously uplink power control "up" commands in the uplink scheduling information to the UE until the UE transmits at PUMAX level.

3. Measure the sum of transmitted power at each antenna connector with a measurement filter of bandwidths according to Table 6.5D.3\_2.1.5-1. The centre frequency of the filter shall be stepped in contiguous steps according to Table 6.5D.3\_2.1.5-1. The measured power shall be verified for each step. The measurement period shall capture the active time slots. During measurement the spectrum analyser shall be set to 'Detector' = RMS. If the sweep count is higher than one, the trace mode shall be average.

6.5D.3\_2.1.4.3 Message contents

Message contents are according to TS 38.508-1 [5] subclause 4.6 and 5.4 ensuring Table 4.6.3-182 with the condition 2TX\_UL\_MIMO.

Message contents in initial conditions are according to TS 38.508-1 [5] subclause 4.3.6.1.1.2 ensuring UL/SUL indicator in Table 4.3.6.1.1.2-1 with condition SUL, subclause 4.6 ensuring Tables 4.6.1-28 with condition SUL AND (RF OR RRM), 4.6.3-14 with condition SUL\_SUL for SUL carrier, and Table 4.6.3-167 with condition PUSCH\_PUCCH\_ON\_SUL.

6.5D.3\_2.1.5 Test requirement

The measured average power of spurious emission on the SUL carrier shall not exceed the described value in Table 6.5D.3\_2.1.5-1.

The spurious emission limits apply for the frequency ranges that are more than ΔfOOB (MHz) in Table 6.5.3.1.3-1 from the edge of the channel bandwidth.

Table 6.5D.3\_2.1.5-1: General spurious emissions test requirements

|  |  |  |  |
| --- | --- | --- | --- |
| Frequency Range | Maximum Level | Measurement bandwidth | NOTE |
| 9 kHz ≤ f < 150 kHz | -36 dBm | 1 kHz |  |
| 150 kHz ≤ f < 30 MHz | -36 dBm | 10 kHz |  |
| 30 MHz ≤ f < 1000 MHz | -36 dBm | 100 kHz |  |
| 1 GHz ≤ f < 12.75 GHz | -30 dBm | 1 MHz |  |
| 12.75 GHz ≤ f < 5th harmonic of the upper frequency edge of the UL operating band in GHz | -30 dBm | 1 MHz | 1 |
| 12.75 GHz < f < 26 GHz | -30 dBm | 1 MHz | 2 |
| NOTE 1: Applies for Band that the upper frequency edge of the UL Band more than 2.69 GHz  NOTE 2: Applies for Band that the upper frequency edge of the UL Band more than 5.2 GHz | | | |

#### 6.5D.3\_2.2 Spurious emissions for UE co-existence for SUL with UL MIMO

6.5D.3\_2.2.1 Test purpose

To verify that UE transmitter does not cause unacceptable interference to co-existing systems for the specified bands which has specific requirements in terms of transmitter spurious emissions.

6.5D.3\_2.2.2 Test applicability

This test applies to all types of NR UE release 15 and forward that support SUL operating on the SUL bands.

6.5D.3\_2.2.3 Minimum conformance requirements

For a terminal that supports SUL for the band combination specified in Table 5.2C-1, the current version of the specification assumes the terminal is configured with active transmission either on UL carrier or SUL carrier at any time in one serving cell and the UE requirements for single carrier shall apply for the active UL or SUL carrier accordingly.

For UE supporting UL MIMO, the requirements for Spurious emissions which are caused by unwanted transmitter effects such as harmonics emission, parasitic emissions, intermodulation products and frequency conversion products is defined as the sum of the emissions from both UE transmit antenna connectors.

The spurious emission for UE co-existence requirements specified in clause 6.5.3.2.3 apply. For UEs with two transmit antenna connectors in closed-loop spatial multiplexing scheme, the requirements shall be met with the UL MIMO configurations described in clause 6.2D.1\_1.

The normative reference for this requirement is TS 38.101-1 [2] subclauses 6.5D.3 and 6.5.3.2.

6.5D.3\_2.2.4 Test description

6.5D.3\_2.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, test channel bandwidths and sub-carrier spacing based on NR operating bands specified in Table 5.5C-1. All of these configurations shall be tested with applicable test parameters for each combination of channel bandwidth and sub-carrier spacing, are shown in table 6.5D.3\_2.2.4.1-1. The details of the uplink reference measurement channels (RMCs) are specified in Annexes A.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Table 6.5D.3\_2.2.4-1: Test Configuration Table

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Initial Conditions | | | | | |
| Test Environment as specified in TS 38.508-1 [5] subclause 4.1 | | | Normal | | |
| Test Frequencies as specified in TS 38.508-1 [5] subclause 4.3.1 | | | Low range, Mid range, High range for SUL carrier  Mid range for Non-SUL carrier | | |
| Test Channel Bandwidths as specified in TS 38.508-1 [5] subclause 4.3.1 | | | Lowest, Mid, Highest for SUL carrier  Lowest for Non-SUL carrier | | |
| Test SCS as specified in Table 5.3.5-1 | | | 15kHz for SUL carrier and Lowest supported SCS for Non-SUL carrier | | |
| Test Parameters for Channel Bandwidths | | | | | |
| Test ID | Downlink Configuration | UL Configuration | | SUL Configuration | |
|  | N/A | N/A | | Modulation | RB allocation (NOTE 1) |
| 1 |  |  | | CP-OFDM QPSK | OuterFull |
| 2 |  |  | | CP-OFDM QPSK | Edge\_1RB\_Left |
| 3 |  |  | | CP-OFDM QPSK | Edge\_1RB\_Right |
| NOTE 1: The specific configuration of each RB allocation is defined in Table 6.1-1 Common UL configuration.  NOTE 2: Test Channel Bandwidths are checked separately for each SUL band combination, the applicable channel bandwidths are specified in Table 5.5C-1. | | | | | |

1. Connect the SS to the UE antenna connectors as shown in TS 38.508-1 [5] Annex A, Figure A.3.1.2.2 for TE diagram and section A.3.2 for UE diagram.

2. The parameter settings for the cell are set up according to TS 38.508-1 [6] subclause 4.4.3.

3. Downlink signals are initially set up according to Annex C.0, C.1, C.2, and uplink signals according to Annex G.0, G.1, G.2, G.3.0 with consideration of supplementary uplink physical channels.

4. The UL Reference Measurement channels are set according to Table 6.5D.3\_2.2.4.1-1.

5. Propagation conditions are set according to Annex B.0.

6. Ensure the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On,* Test Mode *On* and Test Loop Function *On* according to TS 38.508-1 [5] clause 4.5. Message contents are defined in clause 6.5D.3\_2.2.4.3.

6.5D.3\_2.2.4.2 Test procedure

1 SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0\_1 for C\_RNTI to schedule the UL RMC according to Table 6.5D.3\_2.2.4.1-1. Since the UE has no payload data to send, the UE transmits uplink MAC padding bits on the UL RMC. The PDCCH DCI format 0\_1 is specified with condition 2TX\_UL\_MIMO in 38.508-1 [5] subclause 4.3.6.1.1.2.

2. Send continuously uplink power control "up" commands in the uplink scheduling information to the UE until the UE transmits at PUMAX level.

3. Measure the sum of transmitted power at each UE antenna connector with a measurement filter of bandwidths according to Table 6.5.3.2.3-1. The centre frequency of the filter shall be stepped in contiguous steps according to Table 6.5.3.2.3-1. The measured power shall be verified for each step. The measurement period shall capture the active time slots. During measurement the spectrum analyser shall be set to 'Detector' = RMS. If the sweep count is higher than one, the trace mode shall be average.

6.5D.3\_2.2.4.3 Message contents

Message contents are according to TS 38.508-1 [5] subclause 4.6 ensuring Table 4.6.3-182 with condition 2TX\_UL\_MIMO.

Message contents in initial conditions are according to TS 38.508-1 [5] subclause 4.3.6.1.1.2 ensuring UL/SUL indicator in Table 4.3.6.1.1.2-1 with condition SUL, subclause 4.6 ensuring Tables 4.6.1-28 with condition SUL AND (RF OR RRM), 4.6.3-14 with condition SUL\_SUL for SUL carrier, and Table 4.6.3-167 with condition PUSCH\_PUCCH\_ON\_SUL.

6.5D.3\_2.2.5 Test requirement

The measured average power of spurious emission, derived in step 3 from both UE antenna connectors, shall not exceed the described value in Table 6.5.3.2.3-1.

#### 6.5D.3\_2.3 Additional spurious emissions for SUL with UL MIMO

6.5D.3\_2.3.1 Test purpose

To verify that UE transmitter does not cause unacceptable interference to other channels or other systems in terms of transmitter spurious emissions under the deployment scenarios where additional requirements are specified.

6.5D.3\_2.3.2 Test applicability

This test applies to all types of NR UE release 17 and forward that support SUL and UL MIMO operating on the SUL bands.

6.5D.3\_2.3.3 Minimum conformance requirements

For UE supporting UL MIMO, the requirements for Spurious emissions which are caused by unwanted transmitter effects such as harmonics emission, parasitic emissions, intermodulation products and frequency conversion products is defined as the sum of the emissions from both UE transmit antenna connectors.

The additional spurious emission requirements specified in clause 6.5.3.3.3 apply to the UE operating on SUL bands. For UEs with two transmit antenna connectors in closed-loop spatial multiplexing scheme, the requirements shall be met with the UL MIMO configurations described in clause 6.2D.1\_1.

The normative reference for this requirement is TS 38.101-1 [2] clauses 6.5D.3 and 6.5.3.3

6.5D.3\_2.3.4 Test description

6.5D.3\_2.3.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, test channel bandwidths and sub-carrier spacing based on NR operating bands specified in Table 5.5C-1. All these configurations shall be tested with applicable test parameters for each combination of channel bandwidth and sub-carrier spacing, and are shown in Table 6.5D.3\_2.3.4.1-1 through Table 6.5D.3\_2.3.4.1-3. The details of the uplink reference measurement channels (RMCs) are specified in Annex A.2.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Table 6.5D.3\_2.3.4-1: Test Configuration Table (network signalling value “NS\_05”)

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Initial Conditions | | | | | | | | | |
| Test Environment as specified in TS 38.508-1 [5] subclause 4.1 | | | | | Normal | | | | |
| Test Frequencies as specified in TS 38.508-1 [5] subclause 4.3.1 | | | | | Use centre frequency (Fc) as specified in test parameters for SUL carrier  Mid range for Non-SUL carrier | | | | |
| Test Channel Bandwidths as specified in TS 38.508-1 [5] subclause 4.3.1 | | | | | 5 MHz, 10 MHz, 15 MHz, 20 MHz for SUL carrier  Lowest for Non-SUL carrier | | | | |
| Test SCS as specified in Table 5.3.5-1 | | | | | 15kHz for SUL carrier and Lowest supported SCS for Non-SUL carrier | | | | |
| Additional Spurious for SUL test parameters for NS\_05 | | | | | | | | | |
| Test ID | Fc  (MHz) | SUL  ChBw (MHz) | Downlink Config. | Uplink Config | | A-MPR | SUL Configuration | | |
| Modulation | | RB allocation (Note 1) |
| 1 | 1922.5 | 5 | A3 | CP-OFDM | QPSK | Outer\_Full |
| 2 | 1925 | 10 | A1 | QPSK | Outer\_Full |
| 3 | 1925 | 10 | A7 | QPSK | 42@10 |
| 4 | 1925 | 10 | A2 | QPSK | 6@40 |
| 5 | 1935 | 10 | A4 | QPSK | Outer\_Full |
| 6 | 1927.5 | 15 | A1 | QPSK | Outer\_Full |
| 7 | 1927.5 | 15 | A7 | QPSK | 60@19 |
| 8 | 1927.5 | 15 | A2 | QPSK | 6@56 |
| 9 | 1932.5 | 15 | A1 | QPSK | Outer\_Full |
| 10 | 1932.5 | 15 | A2 | QPSK | 6@68 |
| 11 | 1942.5 | 15 | A5 | QPSK | Outer\_Full |
| 12 | 1930 | 20 | A1 | QPSK | Outer\_Full |
| 13 | 1930 | 20 | A7 | QPSK | 78@28 |
| 14 | 1930 | 20 | A2 | QPSK | 6@76 |
| 15 | 1950 | 20 | A6 | QPSK | Outer\_Full |
| 16 | 1922.5 | 5 | A3 | 16 QAM | Outer\_Full |
| 17 | 1925 | 10 | A1 | 16 QAM | Outer\_Full |
| 18 | 1925 | 10 | A7 | 16 QAM | 42@10 |
| 19 | 1925 | 10 | A2 | 16 QAM | 6@40 |
| 20 | 1935 | 10 | A4 | 16 QAM | Outer\_Full |
| 21 | 1927.5 | 15 | A1 | 16 QAM | Outer\_Full |
| 22 | 1927.5 | 15 | A7 | 16 QAM | 60@19 |
| 23 | 1927.5 | 15 | A2 | 16 QAM | 6@56 |
| 24 | 1932.5 | 15 | A1 | 16 QAM | Outer\_Full |
| 25 | 1932.5 | 15 | A2 | 16 QAM | 6@68 |
| 26 | 1942.5 | 15 | A5 | 16 QAM | Outer\_Full |
| 27 | 1930 | 20 | A1 | 16 QAM | Outer\_Full |
| 28 | 1930 | 20 | A7 | 16 QAM | 78@28 |
| 29 | 1930 | 20 | A2 | 16 QAM | 6@76 |
| 30 | 1950 | 20 | A6 | 16 QAM | Outer\_Full |
| 31 | 1922.5 | 5 | A3 | 64 QAM | Outer\_Full |
| 32 | 1925 | 10 | A1 | 64 QAM | Outer\_Full |
| 33 | 1925 | 10 | A7 | 64 QAM | 42@10 |
| 34 | 1925 | 10 | A2 | 64 QAM | 6@40 |
| 35 | 1927.5 | 15 | A1 | 64 QAM | Outer\_Full |
| 36 | 1927.5 | 15 | A7 | 64 QAM | 60@19 |
| 37 | 1927.5 | 15 | A2 | 64 QAM | 6@56 |
| 38 | 1932.5 | 15 | A1 | 64 QAM | Outer\_Full |
| 39 | 1932.5 | 15 | A2 | 64 QAM | 6@68 |
| 40 | 1930 | 20 | A1 | 64 QAM | Outer\_Full |
| 41 | 1930 | 20 | A7 | 64 QAM | 78@28 |
| 42 | 1930 | 20 | A2 | 64 QAM | 6@76 |
| 43 | 1922.5 | 5 | A3 | 256 QAM | Outer\_Full |
| 44 | 1925 | 10 | A1 | 256 QAM | Outer\_Full |
| 45 | 1925 | 10 | A7 | 256 QAM | 42@10 |
| 46 | 1927.5 | 15 | A1 | 256 QAM | Outer\_Full |
| 47 | 1927.5 | 15 | A7 | 256 QAM | 60@19 |
| 48 | 1932.5 | 15 | A1 | 256 QAM | Outer\_Full |
| 49 | 1930 | 20 | A1 | 256 QAM | Outer\_Full |
| 50 | 1930 | 20 | A7 | 256 QAM | 78@28 |
| NOTE 1: The specific configuration of each RB allocation is defined in Table 6.1-1 unless otherwise stated in this table. | | | | | | | | | |

Table 6.5D.3\_2.3.4-2: Test Configuration Table (network signalling value “NS\_05U”)

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Initial Conditions | | | | | | | | | |
| Test Environment as specified in TS 38.508-1 [5] subclause 4.1 | | | | | Normal | | | | |
| Test Frequencies as specified in TS 38.508-1 [5] subclause 4.3.1 | | | | | Use centre frequency (Fc) as specified in test parameters for SUL carrier  Mid range for Non-SUL carrier | | | | |
| Test Channel Bandwidths as specified in TS 38.508-1 [5] subclause 4.3.1 | | | | | 5 MHz, 10 MHz, 15 MHz, 20 MHz for SUL carrier  Lowest for Non-SUL carrier | | | | |
| Test SCS as specified in Table 5.3.5-1 | | | | | 15kHz for SUL carrier and Lowest supported SCS for Non-SUL carrier | | | | |
| Additional Spurious for SUL test parameters for NS\_05 | | | | | | | | | |
| Test ID | Fc  (MHz) | SUL  ChBw (MHz) | Downlink Config. | Uplink Config | | A-MPR | SUL Configuration | | |
| Modulation | | RB allocation (Note 1) |
| 1 | 1922.5 | 5 | A3 | CP-OFDM | QPSK | Outer\_Full |
| 2 | 1925 | 10 | A1 | QPSK | Outer\_Full |
| 3 | 1925 | 10 | A7 | QPSK | 42@10 |
| 4 | 1925 | 10 | A2 | QPSK | 6@40 |
| 5 | 1935 | 10 | A4 | QPSK | Outer\_Full |
| 6 | 1927.5 | 15 | A1 | QPSK | Outer\_Full |
| 7 | 1927.5 | 15 | A7 | QPSK | 60@19 |
| 8 | 1927.5 | 15 | A2 | QPSK | 6@56 |
| 9 | 1932.5 | 15 | A1 | QPSK | Outer\_Full |
| 10 | 1932.5 | 15 | A2 | QPSK | 6@68 |
| 11 | 1942.5 | 15 | A5 | QPSK | Outer\_Full |
| 12 | 1930 | 20 | A1 | QPSK | Outer\_Full |
| 13 | 1930 | 20 | A7 | QPSK | 78@28 |
| 14 | 1930 | 20 | A2 | QPSK | 6@76 |
| 15 | 1950 | 20 | A6 | QPSK | Outer\_Full |
| 16 | 1922.5 | 5 | A3 | 16 QAM | Outer\_Full |
| 17 | 1925 | 10 | A1 | 16 QAM | Outer\_Full |
| 18 | 1925 | 10 | A7 | 16 QAM | 42@10 |
| 19 | 1925 | 10 | A2 | 16 QAM | 6@40 |
| 20 | 1935 | 10 | A4 | 16 QAM | Outer\_Full |
| 21 | 1927.5 | 15 | A1 | 16 QAM | Outer\_Full |
| 22 | 1927.5 | 15 | A7 | 16 QAM | 60@19 |
| 23 | 1927.5 | 15 | A2 | 16 QAM | 6@56 |
| 24 | 1932.5 | 15 | A1 | 16 QAM | Outer\_Full |
| 25 | 1932.5 | 15 | A2 | 16 QAM | 6@68 |
| 26 | 1942.5 | 15 | A5 | 16 QAM | Outer\_Full |
| 27 | 1930 | 20 | A1 | 16 QAM | Outer\_Full |
| 28 | 1930 | 20 | A7 | 16 QAM | 78@28 |
| 29 | 1930 | 20 | A2 | 16 QAM | 6@76 |
| 30 | 1950 | 20 | A6 | 16 QAM | Outer\_Full |
| 31 | 1922.5 | 5 | A3 | 64 QAM | Outer\_Full |
| 32 | 1925 | 10 | A1 | 64 QAM | Outer\_Full |
| 33 | 1925 | 10 | A7 | 64 QAM | 42@10 |
| 34 | 1925 | 10 | A2 | 64 QAM | 6@40 |
| 35 | 1935 | 10 | A4 | 64 QAM | Outer\_Full |
| 36 | 1927.5 | 15 | A1 | 64 QAM | Outer\_Full |
| 37 | 1927.5 | 15 | A7 | 64 QAM | 60@19 |
| 38 | 1927.5 | 15 | A2 | 64 QAM | 6@56 |
| 39 | 1932.5 | 15 | A1 | 64 QAM | Outer\_Full |
| 40 | 1932.5 | 15 | A2 | 64 QAM | 6@68 |
| 41 | 1942.5 | 15 | A5 | 64 QAM | Outer\_Full |
| 42 | 1930 | 20 | A1 | 64 QAM | Outer\_Full |
| 43 | 1930 | 20 | A7 | 64 QAM | 78@28 |
| 44 | 1930 | 20 | A2 | 64 QAM | 6@76 |
| 45 | 1950 | 20 | A6 | 64 QAM | Outer\_Full |
| 46 | 1922.5 | 5 | A3 | 256 QAM | Outer\_Full |
| 47 | 1925 | 10 | A1 | 256 QAM | Outer\_Full |
| 48 | 1925 | 10 | A7 | 256 QAM | 42@10 |
| 49 | 1935 | 10 | A4 | 256 QAM | Outer\_Full |
| 50 | 1927.5 | 15 | A1 | 256 QAM | Outer\_Full |
| 51 | 1927.5 | 15 | A7 | 256 QAM | 60@19 |
| 52 | 1932.5 | 15 | A1 | 256 QAM | Outer\_Full |
| 53 | 1942.5 | 15 | A5 | 256 QAM | Outer\_Full |
| 54 | 1930 | 20 | A1 | 256 QAM | Outer\_Full |
| 55 | 1930 | 20 | A7 | 256 QAM | 78@28 |
| 56 | 1950 | 20 | A6 | 256 QAM | Outer\_Full |
| NOTE 1: The specific configuration of each RB allocation is defined in Table 6.1-1 unless otherwise stated in this table. | | | | | | | | | |

Table 6.5D.3\_2.3.4-3: Test Configuration Table (network signalled value “NS\_56”)

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Initial Conditions | | | | | | | | |
| Test Environment as specified in TS 38.508-1 [5] subclause 4.1 | | | | | | | Normal | |
| Test Frequencies as specified in TS 38.508-1 [5] subclause 4.3.1 | | | | | | | Use uplink carrier centre frequency (Fc) as specified in test parameters | |
| Test Channel Bandwidths as specified in TS 38.508-1 [5] subclause 4.3.1 | | | | | | | 5 MHz, 10 MHz as specified in test parameters for SUL carrier  Lowest for non-SUL carrier | |
| Test SCS as specified in Table 5.3.5-1 | | | | | | | 15 kHz for SUL carrier and Lowest supported SCS for Non-SUL carrier | |
| A-MPR test parameters for NS\_56 | | | | | | | | |
| Test ID | Fc  (MHz) | ChBw (MHz) | Downlink Configuration | Uplink Configuration | A-MPR | Uplink Configuration | | |
| Modulation | | RB allocation (Note 1) |
| SCS 15 kHz |
| 66 | Low | 5 | N/A for A-MPR testing | N/A | 14 | CP-OFDM | QPSK | Edge\_1RB\_Left |
| 67 | Low | 5 | 6 | QPSK | Outer\_Full |
| 68 | Low | 5 | 4 | QPSK | 21@4 |
| 69 | Low | 5 | 4 | QPSK | 1@4 |
| 70 | Low | 5 | 14 | 16 QAM | Edge\_1RB\_Left |
| 71 | Low | 5 | 6 | 16 QAM | Outer\_Full |
| 72 | Low | 5 | 4 | 16 QAM | 21@4 |
| 73 | Low | 5 | 4 | 16 QAM | 1@4 |
| 74 | Low | 5 | 14 | 64 QAM | Edge\_1RB\_Left |
| 75 | Low | 5 | 6 | 64 QAM | Outer\_Full |
| 76 | Low | 5 | 4 | 64 QAM | 21@4 |
| 77 | Low | 5 | 4 | 64 QAM | 1@4 |
| 78 | Low | 5 | 14 | 256 QAM | Edge\_1RB\_Left |
| 79 | Low | 5 | 6 | 256 QAM | Outer\_Full |
| 80 | Low | 5 | 4 | 256 QAM | 21@4 |
| 81 | Low | 5 | 4 | 256 QAM | 1@4 |
| 82 | Low | 10 | 12 | QPSK | Edge\_1RB\_Left |
| 83 | Low | 10 | 8 | QPSK | Outer\_Full |
| 84 | Low | 10 | 6 | QPSK | 1@3 |
| 85 | Low | 10 | 6 | QPSK | 43@9 |
| 86 | Low | 10 | 4 | QPSK | 1@35 |
| 87 | Low | 10 | 2 | QPSK | 17@35 |
| 88 | Low | 10 | 5 | QPSK | Edge\_1RB\_Right |
| 89 | Low | 10 | 5 | QPSK | 1@40 |
| 90 | Low | 10 | 3 | QPSK | 8@44 |
| 91 | Low | 10 | 12 | 16 QAM | Edge\_1RB\_Left |
| 92 | Low | 10 | 8 | 16 QAM | Outer\_Full |
| 93 | Low | 10 | 6 | 16 QAM | 1@3 |
| 94 | Low | 10 | 6 | 16 QAM | 43@9 |
| 95 | Low | 10 | 4 | 16 QAM | 1@35 |
| 96 | Low | 10 | 2 | 16 QAM | 17@35 |
| 97 | Low | 10 | 5 | 16 QAM | Edge\_1RB\_Right |
| 98 | Low | 10 | 5 | 16 QAM | 1@40 |
| 99 | Low | 10 | 3 | 16 QAM | 8@44 |
| 100 | Low | 10 | 12 | 64 QAM | Edge\_1RB\_Left |
| 101 | Low | 10 | 8 | 64 QAM | Outer\_Full |
| 102 | Low | 10 | 6 | 64 QAM | 1@3 |
| 103 | Low | 10 | 6 | 64 QAM | 43@9 |
| 104 | Low | 10 | 4 | 64 QAM | 1@35 |
| 105 | Low | 10 | 2 | 64 QAM | 17@35 |
| 106 | Low | 10 | 5 | 64 QAM | Edge\_1RB\_Right |
| 107 | Low | 10 | 5 | 64 QAM | 1@40 |
| 108 | Low | 10 | 3 | 64 QAM | 8@44 |
| 109 | Low | 10 | 12 | 256 QAM | Edge\_1RB\_Left |
| 110 | Low | 10 | 8 | 256 QAM | Outer\_Full |
| 111 | Low | 10 | 6 | 256 QAM | 1@3 |
| 112 | Low | 10 | 6 | 256 QAM | 43@9 |
| 113 | Low | 10 | 4 | 256 QAM | 1@35 |
| 114 | Low | 10 | 2 | 256 QAM | 17@35 |
| 115 | Low | 10 | 5 | 256 QAM | Edge\_1RB\_Right |
| 116 | Low | 10 | 5 | 256 QAM | 1@40 |
| 117 | Low | 10 | 3 | 256 QAM | 8@44 |
| NOTE 1: The specific configuration of each RB allocation is defined in Table 6.1-1 unless otherwise stated in this table. | | | | | | | | |

1. Connect the SS to the UE to the UE antenna connectors as shown in TS 38.508-1 [5] Annex A Figure A.3.1.2.2 for TE diagram and section A.3.2 for UE diagram.

2. The parameter settings for the cell are set up according to TS 38.508-1 [5] subclause 4.4.3.

3. Downlink signals are initially set up according to Annex C.0, C.1, C.2, and uplink signals according to Annex G.0, G.1, G.2, G.3.0 with consideration of supplementary uplink physical channels.

4. The UL Reference Measurement channels are set according to Table 6.5D.3\_2.3.4.1-1 to Table 6.5D.3\_2.3.4.1-3 as appropriate.

5. Propagation conditions are set according to Annex B.0.

6. Ensure the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On,* Test Mode *On* and Test Loop Function *On* according to TS 38.508-1 [5] clause 4.5. Message contents are defined in clause 6.5D.3\_2.3.4.3.

6.5D.3\_2.3.4.2 Test procedure

1 SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0\_1 for C\_RNTI to schedule the UL RMC according to Table 6.5D.3\_2.3.4.1-1 to Table 6.5D.3\_2.3.4.1-3 as appropriate. Since the UE has no payload data to send, the UE transmits uplink MAC padding bits on the UL RMC. The PDCCH DCI format 0\_1 is specified with condition 2TX\_UL\_MIMO in 38.508-1 [5] subclause 4.3.6.1.1.2.

2. Send continuously uplink power control "up" commands in the uplink scheduling information to the UE until the UE transmits at PUMAX level.

3. Measure the sum of the mean power at each UE antenna connector in the channel bandwidth of the radio access mode, which shall meet the requirements described in clauses from 6.2D.2.5, or 6.2D.3.5 as appropriate. The period of measurement shall be at least the continuous duration of 1ms over consecutive active uplink slots and uplink symbols. For TDD, only slots consisting of only UL symbols are under test.

4. Measure the sum of transmitted power at each UE antenna connector with a measurement filter of bandwidths according to clauses 6.5.3.3.3.1 to 6.5.3.3.3.25 as appropriate. The centre frequency of the filter shall be stepped in contiguous steps according to the same table the measured power shall be verified for each step. The measurement period shall capture the active time slots. During measurement the spectrum analyser shall be set to 'Detector' = RMS. If the sweep count is higher than one, the trace mode shall be average.

6.5D.3\_2.3.4.3 Message contents

Message contents are according to TS 38.508-1 [5] subclause 4.6 ensuring Table 4.6.3-182 with condition 2TX\_UL\_MIMO and same exceptions listed in clause 6.5.3.3.4.3

Message contents in initial conditions are according to TS 38.508-1 [5] subclause 4.3.6.1.1.2 ensuring UL/SUL indicator in Table 4.3.6.1.1.2-1 with condition SUL, subclause 4.6 ensuring Table 4.6.1-28 with condition SUL AND (RF OR RRM), Tables 4.6.3-14 with condition SUL\_SUL for SUL carrier, and Table 4.6.3-167 with condition PUSCH\_PUCCH\_ON\_SUL, together with exceptions as specified in clause 6.5.3.3.4.3 as appropriate for different NS values.

6.5D.3\_2.3.5 Test requirement

For SUL operation, the measured power at each UE antenna connector shall meet the requirements for the specified NR band for an additional spurious emission requirement with protected bands as indicated in clause 6.5.3.3.5 for different NS values.

NOTE: For measurement conditions at the edge of each frequency range, the lowest frequency of the measurement position in each frequency range should be set at the lowest boundary of the frequency range plus MBW/2. The highest frequency of the measurement position in each frequency range should be set at the highest boundary of the frequency range minus MBW/2. MBW denotes the measurement bandwidth defined for the protected band.

### 6.5D.4 Transmit intermodulation for UL MIMO

6.5D.4.1 Test purpose

To verify that the UE transmit intermodulation does not exceed the described value in the test requirement.

The transmit intermodulation performance 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 wanted signal and an interfering signal reaching the transmitter via the antenna.

6.5D.4.2 Test applicability

This test case applies to all types of NR Power Class 1.5, Power Class 2 and Power Class 3 UE release 15 and forward that support 2-layer codebook based UL MIMO.

6.5D.4.3 Minimum conformance requirements

For UE supporting UL MIMO, the transmit intermodulation requirements are specified at each transmit antenna connector and the wanted signal is defined as the sum of output power at each transmit antenna connector.

For UEs with two transmit antenna connectors in closed-loop spatial multiplexing scheme, the requirements specified in subclause 6.5.4 apply to each transmit antenna connector. The requirements shall be met with the UL MIMO configurations described in sub-clause 6.2D.1.

If UE is configured for transmission on single-antenna port, the requirements in subclause 6.5.4 apply.

The normative reference for this requirement is TS 38.101-1 [2] clauses 6.5D.4 and 6.5.4.

6.5D.4.4 Test description

6.5D.4.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, test channel bandwidths and sub-carrier spacing based on NR operating bands specified in table 5.3.5-1. All of these configurations shall be tested with applicable test parameters for each combination of channel bandwidth and sub-carrier spacing, and are shown in table 6.5D.4.4.1-1. The details of the uplink reference measurement channels (RMCs) are specified in Annexes A.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Table 6.5D.4.4.1-1: Test Configuration Table

|  |  |  |  |
| --- | --- | --- | --- |
| Initial Conditions | | | |
| Test Environment as specified in TS 38.508-1 [5] subclause 4.1 | | Normal | |
| Test Frequencies as specified in TS 38.508-1 [5] subclause 4.3.1 | | Mid range | |
| Test Channel Bandwidths as specified in TS 38.508-1 [5] subclause 4.3.1 | | Mid, Highest | |
| Test SCS as specified in Table 5.3.5-1 | | Lowest, Highest | |
| Test Parameters | | | |
| Test ID | Downlink Configuration | Uplink Configuration | |
|  | N/A for transmit intermodulation test case | Modulation | RB allocation (NOTE 1) |
| 1 | CP-OFDM QPSK | Inner Full |
| NOTE 1: The specific configuration of each RB allocation is defined in Table 6.1-1. | | | |

1. Connect the SS to the UE antenna connectors as shown in TS 38.508-1 [5] Annex A, in Figure A.3.1.3.2 for TE diagram and section A.3.2 for UE diagram.

2. The parameter settings for the cell are set up according to TS 38.508-1 [5] subclause 4.4.3.

3. Downlink signals are initially set up according to Annex C.0, C.1, C.2, and uplink signals according to Annex G.0, G.1, G.2, G.3.0.

4. The UL Reference Measurement channels are set according to Table 6.5D.4.4.1-1.

5. Propagation conditions are set according to Annex B.0.

6. Ensure the UE is in State RRC\_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On,* Test Mode *On* and Test Loop Function *On* according to TS 38.508-1 [5] clause 4.5. Message contents are defined in clause 6.5D.4.4.3.

6.5D.4.4.2 Test procedure

1. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0\_1 for C\_RNTI to schedule the UL RMC according to Table 6.5D.4.4.1-1. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC. The PDCCH DCI format 0\_1 is specified with condition 2TX\_UL\_MIMO in 38.508-1 [5] subclause 4.3.6.1.1.2

2. Send continuously uplink power control "up" commands to the UE until the UE transmits at its PUMAX level.

3. Measure the rectangular filtered mean power at each antenna connector of the UE. For TDD, only slots consisting of only UL symbols are under test.

4. Set the interference signal frequency below the UL carrier frequency using the first offset in table 6.5D.4.5-1.

5. Set the interference CW signal level according to table 6.5D.4.5-1.

6. Search the intermodulation product signals below and above the UL carrier frequency at each UE antenna connector, then measure the rectangular filtered mean power of transmitting intermodulation for both signals, and calculate the ratios for each UE antenna connector with the power measured in step 3.

7. Set the interference signal frequency above the UL carrier frequency using the first offset in table 6.5D.4.5-1.

8. Search the intermodulation product signals below and above the UL carrier frequency at each UE antenna connector, then measure the rectangular filtered mean power of transmitting intermodulation for both signals, and calculate the ratios for each UE antenna with the power measured in step 3.

9. Repeat the measurement using the second offset in table 6.5D.4.5-1.

10. Repeat step 3) until 9) for each of transmit antenna of the UE.

6.5D.4.4.3 Message contents

Message contents are according to TS 38.508-1 [5] subclause 4.6 ensuring Table 4.6.3-182 with condition 2TX\_UL\_MIMO.

6.5D.4.5 Test requirement

The ratio derived in step 6 and 8, shall not exceed the described value in table 6.5D.4.5-1.

Table 6.5D.4.5-1: Transmit Intermodulation

|  |  |  |
| --- | --- | --- |
| Wanted signal  channel bandwidth | BWChannel | |
| Interference signal  frequency offset from channel centre | BWChannel | 2\*BWChannel |
| Interference CW signal level | -40dBc | |
| Intermodulation product | < -29dBc | < -35dBc |
| Measurement bandwidth | The maximum transmission bandwidth configuration among the different SCSs for the channel BW as defined in Table 6.5.2.4.1.5-1 | |
| Measurement offset from channel centre | BWChannel and 2\*BWChannel | 2\*BWChannel and 4\*BWChannel |

### 6.5D.4\_1 Transmit intermodulation for SUL with UL MIMO

6.5D.4\_1.1 Test purpose

To verify that the UE transmit intermodulation does not exceed the described value in the test requirement.

The transmit intermodulation performance 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 wanted signal and an interfering signal reaching the transmitter via the antenna.

6.5D.4\_1.2 Test applicability

This test applies to all types of NR UE release 17 and forward that support SUL and UL MIMO operating on the SUL bands.

6.5D.4\_1.3 Minimum conformance requirements

For UE supporting UL MIMO, the transmit intermodulation requirements are specified at each transmit antenna connector and the wanted signal is defined as the sum of output power at each transmit antenna connector.

For UEs with two transmit antenna connectors in closed-loop spatial multiplexing scheme, the requirements specified in subclause 6.5.4 apply to each transmit antenna connector. The requirements shall be met with the UL MIMO configurations described in sub-clause 6.2D.1.

If UE is configured for transmission on single-antenna port, the requirements in subclause 6.5.4 apply.

The normative reference for this requirement is TS 38.101-1 [2] clauses 6.5D.4 and 6.5.4.

6.5D.4\_1.4 Test description

6.5D.4\_1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, test channel bandwidths and sub-carrier spacing based on NR operating bands specified in table 5.3.5-1. All of these configurations shall be tested with applicable test parameters for each combination of channel bandwidth and sub-carrier spacing and are shown in table 6.5D.4\_1.4.1-1. The details of the uplink reference measurement channels (RMCs) are specified in Annexes A.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Table 6.5D.4\_1.4.1-1: Test Configuration Table

|  |  |  |  |
| --- | --- | --- | --- |
| Initial Conditions | | | |
| Test Environment as specified in TS 38.508-1 [5] subclause 4.1 | | Normal | |
| Test Frequencies as specified in TS 38.508-1 [5] subclause 4.3.1 | | Mid range | |
| Test Channel Bandwidths as specified in TS 38.508-1 [5] subclause 4.3.1 | | Mid, Highest | |
| Test SCS as specified in Table 5.3.5-1 | | Lowest, Highest | |
| Test Parameters | | | |
| Test ID | Downlink Configuration | Uplink Configuration | |
|  | N/A for transmit intermodulation test case | Modulation | RB allocation (NOTE 1) |
| 1 | CP-OFDM QPSK | Inner Full |
| NOTE 1: The specific configuration of each RB allocation is defined in Table 6.1-1. | | | |

1. Connect the SS to the UE antenna connectors as shown in TS 38.508-1 [5] Annex A, in Figure A.3.1.1.5 for TE diagram and section A.3.2 for UE diagram.

2. The parameter settings for the cell are set up according to TS 38.508-1 [5] subclause 4.4.3.

3. Downlink signals are initially set up according to Annex C.0, C.1, C.2, and uplink signals according to Annex G.0, G.1, G.2, G.3.0.

4. The UL Reference Measurement channels are set according to Table 6.5D.4\_1.4.1-1.

5. Propagation conditions are set according to Annex B.0.

6. Ensure the UE is in State RRC\_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On,* Test Mode *On* and Test Loop Function *On* according to TS 38.508-1 [5] clause 4.5. Message contents are defined in clause 6.5D.4\_1.4.3.

6.5D.4\_1.4.2 Test procedure

1. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0\_1 for C\_RNTI to schedule the UL RMC according to Table 6.5D.4.1.4.1-1. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC. The PDCCH DCI format 0\_1 is specified with condition 2TX\_UL\_MIMO in 38.508-1 [5] subclause 4.3.6.1.1.2

2. Send continuously uplink power control "up" commands to the UE until the UE transmits at its PUMAX level.

3. Measure the rectangular filtered mean power at each antenna connector of the UE. For TDD, only slots consisting of only UL symbols are under test.

4. Set the interference signal frequency below the UL carrier frequency using the first offset in table 6.5D.4\_1.5-1.

5. Set the interference CW signal level according to table 6.5D.4\_1.5-1.

6. Search the intermodulation product signals below and above the UL carrier frequency at each UE antenna connector, then measure the rectangular filtered mean power of transmitting intermodulation for both signals and calculate the ratios for each UE antenna connector with the power measured in step 3.

7. Set the interference signal frequency above the UL carrier frequency using the first offset in table 6.5D.4\_1.5-1.

8. Search the intermodulation product signals below and above the UL carrier frequency at each UE antenna connector, then measure the rectangular filtered mean power of transmitting intermodulation for both signals and calculate the ratios for each UE antenna with the power measured in step 3.

9. Repeat the measurement using the second offset in table 6.5D.4\_1.5-1.

10. Repeat step 3) until 9) for each of transmit antenna of the UE.

6.5D.4\_1.4.3 Message contents

Message contents are according to TS 38.508-1 [5] subclause 4.3.6.1.1.2 ensuring UL/SUL indicator in Table 4.3.6.1.1.2-1 with condition SUL, subclause 4.6 ensuring Table 4.6.1-28 with condition SUL AND (RF OR RRM), Tables 4.6.3-14 with condition SUL\_SUL for SUL carrier, Table 4.6.3-167 with condition PUSCH\_PUCCH\_ON\_SUL, and Table 4.6.3-182 with the condition 2TX\_UL\_MIMO.

6.5D.4\_1.5 Test requirement

The ratio derived in step 6 and 8, shall not exceed the described value in table 6.5D.4\_1.5-1.

Table 6.5D.4\_1.5-1: Transmit Intermodulation

|  |  |  |
| --- | --- | --- |
| Wanted signal  channel bandwidth | BWChannel | |
| Interference signal  frequency offset from channel centre | BWChannel | 2\*BWChannel |
| Interference CW signal level | -40dBc | |
| Intermodulation product | < -29dBc | < -35dBc |
| Measurement bandwidth | The maximum transmission bandwidth configuration among the different SCSs for the channel BW as defined in Table 6.5.2.4.1.5-1 | |
| Measurement offset from channel centre | BWChannel and 2\*BWChannel | 2\*BWChannel and 4\*BWChannel |

## 6.5E Output RF spectrum emissions for V2X

### 6.5E.1 Occupied bandwidth for V2X

### 6.5E.2 Out of band emission for V2X

#### 6.5E.2.1 General

When UE is configured for NR V2X sidelink transmissions non-concurrent with NR uplink transmissions for NR V2X operating bands specified in Table 5.2E.1-1, the requirements in clause 6.5E.2 apply for NR V2X sidelink transmission.

For NR V2X UE with two transmit antenna connectors, the requirements specified for single carrier shall apply to each transmit antenna connector. The requirements shall be met with SL MIMO configurations described in clause 6.2D.1.

#### 6.5E.2.2 Spectrum emission mask for V2X

##### 6.5E.2.2.1 Spectrum emission mask for V2X / non-concurrent operation

Editor’s Note: This clause is incomplete for PSFCH and PSBCH measurement. The following aspects are either missing or not yet determined:

- Measurement period of PSFCH and PSBCH is FFS.

6.5E.2.2.1.1 Test purpose

To verify that the power of any UE emission shall not exceed specified level for the specified channel bandwidth when UE is configured for NR V2X sidelink transmissions non-concurrent with NR uplink transmissions.

6.5E.2.2.1.2 Test applicability

This test case applies to all types of NR UE release 16 and forward that support NR V2X sidelink communication with non-concurrent operation.

6.5E.2.2.1.3 Minimum conformance requirements

For NR V2X UE, the existing NR general spectrum emission mask in clause 6.5.2.2 applied for all supporting NR V2X channel bandwidths. The spectrum emission mask of the UE applies to frequencies (ΔfOOB) starting from the ± edge of the assigned NR channel bandwidth. For frequencies greater than (ΔfOOB), the power of any UE emission shall not exceed the levels specified in Table 6.5.2.2.3-1 for the specified channel bandwidth for NR V2X operating bands in Table 5.2E.1-1.

The normative reference for this requirement is TS 38.101-1 [2] clause 6.5E.2.2.

6.5E.2.2.1.4 Test description

6.5E.2.2.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, test channel bandwidths and sub-carrier spacing based on NR operating bands specified in Table 5.2E.1-1 and Table 5.3.5-1. All of these configurations shall be tested with applicable test parameters for each combination of test channel bandwidth and sub-carrier spacing, and are shown in table 6.5E.2.2.1.4.1-1. The details of the V2X reference measurement channels (RMCs) are specified in Annexe A.7.5 and the GNSS configuration in TS 38.508-1 [5] subclause 4.11.

Table 6.5E.2.2.1.4.1-1: Test Configuration Table for contiguous PSCCH and PSSCH allocation

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Initial Conditions | | | | |
| Test Environment as specified in TS 38.508-1 [5] subclause 4.1 | | | Normal | |
| Test Frequencies as specified in TS 38.508-1 [5] subclause 4.3.1.8 | | | Low range, High range | |
| Test Channel Bandwidths as specified TS 38.508-1 [5] subclause 4.3.1 | | | Lowest, Highest | |
| Test SCS as specified in Table 5.3.5-1 | | | Lowest, Highest | |
| Test Parameters for Channel Bandwidths | | | | |
| Test ID | Freq | V2X Configuration to Transmit | | |
|  |  | Modulation | | PSSCH RB allocation  (Note 1) |
| 1 | Default | QPSK | | Outer\_Full |
| 2 | Default | QPSK | | Inner\_Full |
| 3 | Default | 16QAM | | Outer\_Full |
| 4 | Default | 16QAM | | Inner\_Full |
| 5 | Default | 64QAM | | Outer\_Full |
| 6 | Default | 256QAM | | Outer\_Full |
| NOTE 1: The specific configuration of each RB allocation is defined in Table 6.1E-1. | | | | |

Table 6.5E.2.2.1.4.1-2: Test Configuration Table for PSFCH

|  |  |  |  |
| --- | --- | --- | --- |
| Initial Conditions | | | |
| Test Environment as specified in TS 38.508-1 [5] subclause 4.1 | | | Normal |
| Test Frequencies as specified in TS 38.508-1 [5] subclause 4.3.1.8 | | | Low range, High range |
| Test Channel Bandwidths as specified TS 38.508-1 [5] subclause 4.3.1 | | | Lowest, Highest |
| Test SCS as specified in Table 5.3.5-1 | | | Lowest, Highest |
| Test Parameters for Channel Bandwidths | | | |
| Test ID | Freq | V2X Configuration to Transmit | |
|  |  | PSFCH RB allocation  (Note 1) | |
| 1 | Low range | PSFCH\_1RB\_Left | |
| 2 | High range | PSFCH\_1RB\_Right | |
| 3 | Low range | PSFCH\_2RB\_Left | |
| 4 | High range | PSFCH\_2RB\_Right | |
| 5 | Default | PSFCH\_Max\_Gap | |
| NOTE 1: The specific configuration of each RB allocation is defined in Table 6.1E-2. | | | |

Table 6.5E.2.2.1.4.1-3: Test Configuration Table for S-SSB

|  |  |  |  |
| --- | --- | --- | --- |
| Initial Conditions | | | |
| Test Environment as specified in TS 38.508-1 [5] subclause 4.1 | | | Normal |
| Test Frequencies as specified in TS 38.508-1 [5] subclause 4.3.1.8 | | | Low range, High range |
| Test Channel Bandwidths as specified TS 38.508-1 [5] subclause 4.3.1 | | | Lowest, Highest |
| Test SCS as specified in Table 5.3.5-1 | | | Lowest, Highest |
| Test Parameters for Channel Bandwidths | | | |
| Test ID | Freq | V2X Configuration to Transmit | |
|  |  | S-SSB RB allocation  (Note 1) | |
| 1 | Low range | S-SSB\_Low | |
| 2 | High range | S-SSB\_High | |
| 3 | Default | S-SSB\_Mid | |
| NOTE 1: The specific configuration of each RB allocation is defined in Table 6.1E-3. | | | |

1. Connect the SS and GNSS simulator to the UE antenna connectors as shown in TS 38.508-1 [5] Annex A, Figure A.3.1.9.1 for TE diagram and section A.3.2.7 for UE diagram.

2. The parameter settings for the NR sidelink transmission over PC5 are pre-configured according to TS 38.508-1 [5] subclause 4.10. Message content exceptions are defined in clause 6.5E.2.2.1.4.3.

3. The V2X Reference Measurement Channel is set according to Table 6.5E.2.2.1.4.1-1.

4. The GNSS simulator is configured for Scenario #1: static in Geographical area #1, as defined in TS 38.508-1 [5] Table 4.11.2-2. Geographical area #1 is also pre-configured in the UE.

5. Propagation conditions are set according to Annex B.0.

6.5E.2.2.1.4.2 Test procedure

Subtest 1: PSCCH/PSSCH

1. Ensure the UE is in state Out\_of\_Coverage with generic procedure parameters Sidelink *On*, Test Loop Function *On* with UE test loop mode E closed for *Transmit Mode* according to TS 38.508-1 [5] clause 4.5.

2. The UE starts to perform the NR sidelink communication according to *SL-PreconfigurationNR*. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the NR sidelink RMC.

3. Measure the mean power of the UE in the channel bandwidth of the radio access mode according to the test configuration from Table 6.5E.2.2.1.4.1-1, which shall meet the requirements described in Table 6.2E.2.1.5-1 for Power Class 3 UEs. The period of measurement shall be at least continuous duration of one active sub-frame (1ms) excluding guard symbols.

4. Measure the power of the transmitted signal with a measurement filter of bandwidths according to Table 6.5E.2.2.1.5-1 and using a rms detector. If the sweep count is higher than one, the trace mode shall be average. The centre frequency of the filter shall be stepped in continuous steps according to the same table. The measured power shall be recorded for each step. The measurement period shall capture the active TSs.

Subtest 2: PSFCH

1. Ensure the UE is in state Out\_of\_Coverage with generic procedure parameters Sidelink *On*, Cast type *Unicast*, Test Loop Function *On* with UE test loop mode E closed for *Receive Mode* according to TS 38.508-1 [5] clause 4.5.

2. The UE starts to perform the NR sidelink reception according to *SL-PreconfigurationNR*.

3. The UE’s PSFCH transmission occasion is on slot n according to Table 6.5E.2.2.1.4.1-2. SS transmits PSSCH on combination of slot and subchannel as below:

a) Test ID 1: slot n-6, Lowest sub-channel

b) Test ID 2: slot n-3, Highest sub-channel

c) Test ID 3: slot n-6 and n-5, Lowest sub-channel

d) Test ID 4: slot n-4 and n-3, Highest sub-channel

e) Test ID 5: slot n-6, Highest sub-channel and slot n-3, Highest sub-channel

4. Measure the mean power of the UE on slot n in the channel bandwidth according to the test configuration from Table 6.5E.2.2.1.4.1-2, which shall meet the requirements described in Table 6.2E.2.1.5-2 for Power Class 3 UEs. The period of measurement is FFS.

5. Measure the power of the transmitted signal with a measurement filter of bandwidths according to Table 6.5E.2.2.1.5-1 and using a rms detector. If the sweep count is higher than one, the trace mode shall be average. The centre frequency of the filter shall be stepped in continuous steps according to the same table. The measured power shall be recorded for each step. The measurement period shall capture the active TSs.

Subtest 3: S-SSB

1. Ensure the UE is in state Out\_of\_Coverage with generic procedure parameters Sidelink *On* according to TS 38.508-1 [5] clause 4.5. The UE is synchronized to GNSS,

2. The UE transmits PSBCH according *SL-PreconfigurationNR*.

3. Measure the mean power of the S-SSB in the channel bandwidth according to the test configuration from Table 6.5E.2.2.1.4.1-3, which shall meet the requirements described in Table 6.2E.2.1.5-3 for Power Class 3 UEs. The period of measurement is FFS.

4. Measure the power of the transmitted signal with a measurement filter of bandwidths according to Table 6.5E.2.2.1.5-1 and using a rms detector. If the sweep count is higher than one, the trace mode shall be average. The centre frequency of the filter shall be stepped in continuous steps according to the same table. The measured power shall be recorded for each step. The measurement period shall capture the active TSs.

6.5E.2.2.1.4.3 Message contents

Message contents are according to TS 38.508-1 [5] subclause 4.10.

6.5E.2.2.1.5 Test requirement

The measured UE mean power in the channel bandwidth, derived in step 4 of Subtest 1, step 5 of Subtest 2 and step 4 of Subtest 3, shall fulfil requirements in Table 6.2E.2.2.1.5-1 as appropriate, and the power of any UE emission shall fulfil requirements in Table 6.5E.2.2.1.5-1.

Table 6.5E.2.2.1.5-1: General NR spectrum emission mask for V2X / non-concurrent operation

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | Spectrum emission limit (dBm) / Channel bandwidth | | | | | | | | | | | | | |
| ΔfOOB  (MHz) | | 5  MHz | 10  MHz | 15  MHz | 20  MHz | 25  MHz | 30 MHz | 40  MHz | 50  MHz | 60  MHz | 80  MHz | 90  MHz | 100  MHz | Measurement bandwidth |
| ± 0-1 | | -13 + TT | -13 + TT | -13 + TT | -13 + TT | -13 + TT | -13 + TT | -13 + TT |  |  |  |  |  | 1 % channel bandwidth |
| ± 0-1 | |  |  |  |  |  |  |  | -24 + TT | -24 + TT | -24 + TT | -24 + TT | -24 + TT | 30 kHz |
| ± 1-5 | | -10 + TT | -10 + TT | -10 + TT | -10 + TT | -10 + TT | -10 + TT | -10 + TT | -10 + TT | -10 + TT | -10 + TT | -10 + TT | -10 + TT | 1 MHz |
| ± 5-6 | | -13 + TT | -13 + TT | -13 + TT | -13 + TT | -13 + TT | -13 + TT | -13 + TT | -13 + TT | -13 + TT | -13 + TT | -13 + TT | -13 + TT |
| ± 6-10 | | -25 + TT |
| ± 10-15 | |  | -25 + TT |
| ± 15-20 | |  |  | -25 + TT |
| ± 20-25 | |  |  |  | -25 + TT |
| ± 25-30 | |  |  |  |  | -25 + TT |
| ± 30-35 | |  |  |  |  |  | -25 + TT |
| ± 35-40 | |  |  |  |  |  |  |
| ± 40-45 | |  |  |  |  |  |  | -25 + TT |
| ± 45-50 | |  |  |  |  |  |  |  |
| ± 50-55 | |  |  |  |  |  |  |  | -25 + TT |
| ± 55-60 | |  |  |  |  |  |  |  |  |
| ± 60-65 | |  |  |  |  |  |  |  |  | -25 + TT |
| ± 65-80 | |  |  |  |  |  |  |  |  |  |
| ± 80-85 | |  |  |  |  |  |  |  |  |  | -25 + TT |
| ± 85-90 | |  |  |  |  |  |  |  |  |  |  |
| ± 90-95 | |  |  |  |  |  |  |  |  |  |  | -25 + TT |
| ± 95-100 | |  |  |  |  |  |  |  |  |  |  |  |
| ± 100-105 | |  |  |  |  |  |  |  |  |  |  |  | -25 + TT |
| Note 1: The first and last measurement position with a 30 kHz filter is at ΔfOOB equals to 0.015 MHz and 0.985 MHz.  Note 2: At the boundary of spectrum emission limit, the first and last measurement position with a 1 MHz filter is the inside of +0.5MHz and -0.5MHz, respectively.  Note 3: The measurements are to be performed above the upper edge of the channel and below the lower edge of the channel.  Note 4: TT for each frequency and channel bandwidth is specified in Table 6.5E.2.2.1.5-2. | | | | | | | | | | | | | | |

Table 6.5E.2.2.1.5-2: Test Tolerance

FFS

NOTE: As a general rule, the resolution bandwidth of the measuring equipment should be equal to the measurement bandwidth. However, to improve measurement accuracy, sensitivity and efficiency, the resolution bandwidth may be smaller than the measurement bandwidth. When the resolution bandwidth is smaller than the measurement bandwidth, the result should be integrated over the measurement bandwidth in order to obtain the equivalent noise bandwidth of the measurement bandwidth.

##### 6.5E.2.2.1D Spectrum emission mask for V2X / non-concurrent operation / SL-MIMO

Editor’s Note:

- Test config table is FFS

- Uplink RMC is TBD in TS 38.101-1

- Connection diagram is TBD

- Preconfiguration is TBD in 38.508-1

- Test state and generic procedure are TBD in 38.508-1

6.5E.2.2.1D.1 Test purpose

To verify that the power of any UE emission shall not exceed specified level for the specified channel bandwidth when UE is configured for NR V2X sidelink MIMO transmissions non-concurrent with NR uplink transmissions.

6.5E.2.2.1D.2 Test applicability

This test case applies to all types of NR UE release 16 and forward that support NR V2X sidelink MIMO communication with non-concurrent operation.

6.5E.2.2.1D.3 Minimum conformance requirements

For NR V2X UE with two transmit antenna connectors, the requirements specified for single carrier shall apply to each transmit antenna connector. The requirements shall be met with SL MIMO configurations described in clause 6.2D.1.

The normative reference for this requirement is TS 38.101-1 [2] clause 6.5E.2.

6.5E.2.2.1D.4 Test description

6.5E.2.2.1D.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, test channel bandwidths and sub-carrier spacing based on NR operating bands specified in Table 5.3.5-1. All of these configurations shall be tested with applicable test parameters for each combination of test channel bandwidth and sub-carrier spacing, and are shown in table 6.5E.2.2.1D.4.1-1. The details of the V2X reference measurement channels (RMCs) are specified in Annexes TBD.

Table 6.5E.2.2.1D.4.1-1: Test Configuration Table

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1. Connect the SS and GNSS simulator to the UE antenna connectors as shown in TS 38.508-1 [5] Annex A, Figure TBD for TE diagram and section TBD for UE diagram.

2. The parameter settings for the V2X sidelink transmission over PC5 are pre-configured according to TS 38.508-1 [5] subclause TBD. Message content exceptions are defined in clause 6.5E.2.2.1D.4.3.

3. The V2X Reference Measurement Channel is set according to Table 6.5E.2.2.1D.4.1-1.

4. The GNSS simulator is configured for Scenario #1: static in Geographical area #1, as defined in TS36.508 [25] Table 4.11.2-2. Geographical area #1 is also pre-configured in the UE.

5. Propagation conditions are set according to Annex B.0.

6. Ensure the UE is in state TBD.

6.5E.2.2.1D.4.2 Test procedure

1. The V2X UE schedules the V2X RMC with transmission power at PUMAX level according to *SL-V2X-Preconfiguration* which is in line with the test configuration in Table 6.5E.2.2.1D.4.1-1.

2. Measure the sum of mean power of each antenna connector in the channel bandwidth of the radio access mode according to the test configuration, which shall meet the requirements described in [TBD] for Power Class 3 UEs. The period of the measurement shall be at least the continuous duration of one sub-frame (1ms). For TDD slots with transient periods are not under test.

3. Measure the power of each antenna connector of the transmitted signal with a measurement filter of bandwidths according to Table 6.5E.2.2.1D.5-1 and using a rms detector. If the sweep count is higher than one, the trace mode shall be average. The centre frequency of the filter shall be stepped in continuous steps according to the same table. The measured power shall be recorded for each step. The measurement period shall capture the active TSs.

6.5E.2.2.1D.4.3 Message contents

Message contents are according to TS 38.508-1 [5] subclause 4.6 and 5.4.

6.5E.2.2.1D.5 Test requirement

The measured sum of mean power of each antenna connector in the channel bandwidth, derived in step 2, shall fulfil requirements in [TBD] as appropriate, and the power of any UE emission at each antenna connector shall fulfil requirements in Table 6.5E.2.2.1D.5-1.

Table 6.5E.2.2.1D.5-1: General NR spectrum emission mask for V2X / non-concurrent operation / SL-MIMO

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | Spectrum emission limit (dBm) / Channel bandwidth | | | | | | | | | | | | | |
| ΔfOOB  (MHz) | | 5  MHz | 10  MHz | 15  MHz | 20  MHz | 25  MHz | 30 MHz | 40  MHz | 50  MHz | 60  MHz | 80  MHz | 90  MHz | 100  MHz | Measurement bandwidth |
| ± 0-1 | | -13 + TT | -13 + TT | -13 + TT | -13 + TT | -13 + TT | -13 + TT | -13 + TT |  |  |  |  |  | 1 % channel bandwidth |
| ± 0-1 | |  |  |  |  |  |  |  | -24 + TT | -24 + TT | -24 + TT | -24 + TT | -24 + TT | 30 kHz |
| ± 1-5 | | -10 + TT | -10 + TT | -10 + TT | -10 + TT | -10 + TT | -10 + TT | -10 + TT | -10 + TT | -10 + TT | -10 + TT | -10 + TT | -10 + TT | 1 MHz |
| ± 5-6 | | -13 + TT | -13 + TT | -13 + TT | -13 + TT | -13 + TT | -13 + TT | -13 + TT | -13 + TT | -13 + TT | -13 + TT | -13 + TT | -13 + TT |
| ± 6-10 | | -25 + TT |
| ± 10-15 | |  | -25 + TT |
| ± 15-20 | |  |  | -25 + TT |
| ± 20-25 | |  |  |  | -25 + TT |
| ± 25-30 | |  |  |  |  | -25 + TT |
| ± 30-35 | |  |  |  |  |  | -25 + TT |
| ± 35-40 | |  |  |  |  |  |  |
| ± 40-45 | |  |  |  |  |  |  | -25 + TT |
| ± 45-50 | |  |  |  |  |  |  |  |
| ± 50-55 | |  |  |  |  |  |  |  | -25 + TT |
| ± 55-60 | |  |  |  |  |  |  |  |  |
| ± 60-65 | |  |  |  |  |  |  |  |  | -25 + TT |
| ± 65-80 | |  |  |  |  |  |  |  |  |  |
| ± 80-85 | |  |  |  |  |  |  |  |  |  | -25 + TT |
| ± 85-90 | |  |  |  |  |  |  |  |  |  |  |
| ± 90-95 | |  |  |  |  |  |  |  |  |  |  | -25 + TT |
| ± 95-100 | |  |  |  |  |  |  |  |  |  |  |  |
| ± 100-105 | |  |  |  |  |  |  |  |  |  |  |  | -25 + TT |
| Note 1: The first and last measurement position with a 30 kHz filter is at ΔfOOB equals to 0.015 MHz and 0.985 MHz.  Note 2: At the boundary of spectrum emission limit, the first and last measurement position with a 1 MHz filter is the inside of +0.5MHz and -0.5MHz, respectively.  Note 3: The measurements are to be performed above the upper edge of the channel and below the lower edge of the channel.  Note 4: TT for each frequency and channel bandwidth is specified in Table 6.5E.2.2.5-2. | | | | | | | | | | | | | | |

Table 6.5E.2.2.1D.5-2: Test Tolerance

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#### 6.5E.2.3 Additional Spectrum emission mask for V2X

##### 6.5E.2.3.0 Minimum conformance requirements

6.5E.2.3.0.1 Requirements for network signalling value "NS\_33"

The additional spectrum mask in Table 6.5E.2.3.0.1-1 applies for NR V2X UE within 5 855 MHz to 5 950 MHz according to ETSI EN 302 571. Additional spectrum emission requirements are signalled by the network to indicate that the UE shall meet an additional requirement for a specific deployment scenario as part of the cell handover/broadcast message.

When "NS\_33" is indicated in the cell or pre-configured radio parameters, the power of any V2X UE emission shall not exceed the levels specified in Table 6.5E.2.3.0.1-1.

Table 6.5E.2.3.0.1-1: Additional spectrum mask requirements for 10MHz channel bandwidth

|  |  |  |
| --- | --- | --- |
| Spectrum emission limit (dBm EIRP)/ Channel bandwidth | | |
| ΔfOOB  (MHz) | 10 MHz | Measurement bandwidth |
| ± 0-0.5 | [] | 100 kHz |
| ± 0.5-5 | [] | 100 kHz |
| ± 5-10 | [] | 100 kHz |

NOTE 1: As a general rule, the resolution bandwidth of the measuring equipment should be equal to the measurement bandwidth. However, to improve measurement accuracy, sensitivity and efficiency, the resolution bandwidth may be smaller than the measurement bandwidth. When the resolution bandwidth is smaller than the measurement bandwidth, the result should be integrated over the measurement bandwidth in order to obtain the equivalent noise bandwidth of the measurement bandwidth.

NOTE 2: Additional SEM for NR V2X overrides any other requirements in frequency range 5855-5950MHz.

NOTE 3: The EIRP requirement is converted to conducted requirement depend on the supported post antenna connector gain Gpost connector declared by the UE following the principle described in annex I in [11].

6.5E.2.3.0.2 Requirements for network signalling value "NS\_52"

The additional spectrum mask in Table 6.5E.2.3.0.2-1 applies for NR V2X UE within 5 765 MHz to 6 005 MHz according to FCC regulation. Additional spectrum emission requirements are signalled by the network to indicate that the UE shall meet an additional requirement for a specific deployment scenario as part of the cell handover/broadcast message.

When "NS\_52" is indicated in the cell or pre-configured radio parameters, the power of any V2X UE emission shall not exceed the levels specified in Table 6.5E.2.3.0.2-1.

Table 6.5E.2.3.0.2-1: Additional spectrum mask requirements for 40MHz channel bandwidth (fc = 5885MHz)

|  |  |  |
| --- | --- | --- |
| ΔfOOB (MHz) | Emission Limit (dBm) | Measurement Bandwidth |
| ±0-2 | -32 | 100kHz |
| ±2-10 | -36 | 100kHz |
| ±10-20 | -38 | 100kHz |
| ±20-40 | -43 | 100kHz |
| ±40-100 | -50 | 100kHz |

NOTE: The ASE requirements for NS\_52 will not be verified until the corresponding regulation release a formal rule for C-V2X emission limits.

The normative reference for this requirement is TS 38.101-1 [2] clause 6.5E.2.3.

##### 6.5E.2.3.1 Additional Spectrum emission mask for V2X / non-concurrent operation

6.5E.2.3.1.1 Test purpose

To verify that the power of NR V2X UE emission shall not exceed specified level for the specified channel bandwidth under the deployment scenarios where additional requirements are specified.

6.5E.2.3.1.2 Test applicability

This test case applies to all types of NR UE release 16 and forward that support NR V2X sidelink communication with non-concurrent operation.

6.5E.2.3.1.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 6.5E.2.3.0.

6.5E.2.3.1.3.1 Void

6.5E.2.3.1.3.2 Void

6.5E.2.3.1.4 Test description

6.5E.2.3.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, test channel bandwidths and sub-carrier spacing based on NR operating bands specified in Table 5.2E.1-1 and Table 5.3.5-1. All of these configurations shall be tested with applicable test parameters for each combination of test channel bandwidth and sub-carrier spacing, and are shown in clause 6.2E.3.1.4.1. The details of the V2X reference measurement channels (RMCs) are specified in Annexe A.7.5 and the GNSS configuration in TS 38.508-1 [5] subclause 4.11.

Table 6.5E.2.3.1.4.1-1: Void

1. Connect the SS and GNSS simulator to the UE antenna connectors as shown in TS 38.508-1 [5] Annex A, Figure A.3.1.9.1 for TE diagram and section A.3.2.7 for UE diagram.

2. The parameter settings for the NR sidelink transmission over PC5 are pre-configured according to TS 38.508-1 [5] subclause 4.10. Message content exceptions are defined in clause 6.5E.2.3.1.4.3.

3. The V2X Reference Measurement Channel is set according to clause 6.2E.3.1.4.1.

4. The GNSS simulator is configured for Scenario #1: static in Geographical area #1, as defined in TS 38.508-1 [5] Table 4.11.2-2. Geographical area #1 is also pre-configured in the UE.

5. Propagation conditions are set according to Annex B.0.

6. Ensure the UE is in state Out\_of\_Coverage with generic procedure parameters Sidelink *On*, Test Loop Function *On* with UE test loop mode E closed for *Transmit Mode* according to TS 38.508-1 [5] clause 4.5.

6.5E.2.3.1.4.2 Test procedure

Subtest 1: PSCCH/PSSCH

1. Ensure the UE is in state Out\_of\_Coverage with generic procedure parameters Sidelink On, Test Loop Function On with UE test loop mode E closed for Transmit Mode according to TS 38.508-1 [5] clause 4.5.

2. The UE starts to perform the NR sidelink communication according to SL-PreconfigurationNR. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the NR sidelink RMC.

3. Measure the mean power of the UE in the channel bandwidth according to the test configuration from Table 6.2E.3.1.4.1-1, which shall meet the requirements described in Table 6.2E.3.1.5-1. The period of the measurement shall be at least the continuous duration of one sub-frame (1ms) excluding guard symbols.

4. Measure the power of the transmitted signal with a measurement filter of bandwidths according to Table 6.5E.2.3.1.5.1-1 or Table 6.5E.2.3.1.5.2-1 and using a rms detector. If the sweep count is higher than one, the trace mode shall be average. The centre frequency of the filter shall be stepped in continuous steps according to the same table. The measured power shall be recorded for each step. The measurement period shall capture the active TSs.

Subtest 2: PSFCH

1. Ensure the UE is in state Out\_of\_Coverage with generic procedure parameters Sidelink On, Cast type Unicast, Test Loop Function On with UE test loop mode E closed for Receive Mode according to TS 38.508-1 [5] clause 4.5.

2. The UE starts to perform the NR sidelink reception according to SL-PreconfigurationNR.

3. The UE’s PSFCH transmission occasion is on slot n according to Table 6.2E.3.1.4.1-2. SS transmits PSSCH on combination of slot and subchannel as below:

a) Test ID 1: slot n-6, Lowest sub-channel

b) Test ID 2, 4, 5 and 6: slot n-6, Lowest sub-channel and slot n-3, Highest sub-channel

c) Test ID 3: slot n-3, Highest sub-channel

4. Measure the mean power of the UE on slot n in the channel bandwidth according to the test configuration from Table 6.2E.3.1.4.1-2, which shall meet the requirements described in Table 6.2E.3.1.5-2. The cumulative measurement period is at least 1ms.

5. Measure the power of the transmitted signal with a measurement filter of bandwidths according to Table 6.5E.2.3.1.5.1-2 or Table 6.5E.2.3.1.5.2-2 and using a rms detector. The centre frequency of the filter shall be stepped in continuous steps according to the same table. The measured power shall be recorded for each step. The measurement period shall capture the active TSs.

Subtest 3: S-SSB

1. Ensure the UE is in state Out\_of\_Coverage with generic procedure parameters Sidelink On according to TS 38.508-1 [5] clause 4.5. The UE is synchronized to GNSS,

2. The UE transmits PSBCH according SL-PreconfigurationNR.

3. Measure the mean power of the S-SSB in the channel bandwidth according to the test configuration from Table 6.2E.3.1.4.1-3, which shall meet the requirements described in Table 6.2E.3.1.5-3. The cumulative measurement period is at least 1ms.

4. Measure the power of the transmitted signal with a measurement filter of bandwidths according to Table 6.5E.2.3.1.5.1-3 or Table 6.5E.2.3.1.5.2-3 and using a rms detector. The centre frequency of the filter shall be stepped in continuous steps according to the same table. The measured power shall be recorded for each step. The measurement period shall capture the active TSs.

6.5E.2.3.1.4.3 Message contents

Message contents are according to TS 38.508-1 [5] subclause 4.10 with following exceptions.

6.5E.2.3.1.4.3.1 Message contents exceptions (network signalling value “NS\_33”)

For "NS\_33" see A-MPR test case in clause 6.2E.3.1.4.3.1.

Table 6.5E.2.3.1.4.3.1-1: Void

6.5E.2.3.1.4.3.2 Message contents exceptions (network signalling value “NS\_52”)

Table 6.5E.2.3.1.4.3.2-1: Network signalling value "NS\_52"

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [5] clause 4.6.3, Table 4.6.3-1 | | | |
| Information Element | Value/remark | Comment | Condition |
| additionalSpectrumEmission | 1 (NS\_52) |  |  |

6.5E.2.3.1.5 Test requirement

Table 6.5E.2.3.1.5-1: Test Tolerance (Additional spectrum emission mask)

|  |  |  |
| --- | --- | --- |
|  | f ≤ 3.0GHz | 3.0GHz < f ≤ 6.0GHz |
| BW ≤ 40MHz | 1.5 dB | 1.8 dB |

6.5E.2.3.1.5.1 Requirements for network signalling value "NS\_33"

When "NS\_33" is indicated in the cell or pre-configured radio parameters, the power of any NR V2X UE emission shall not exceed the levels specified in Table 6.5E.2.3.1.5.1-1.

Table 6.5E.2.3.1.5.1-1: Additional spectrum mask requirements for 10MHz channel bandwidth

|  |  |  |
| --- | --- | --- |
| Spectrum emission limit (dBm EIRP)/ Channel bandwidth | | |
| ΔfOOB  (MHz) | 10 MHz | Measurement bandwidth |
| ± 0-0.5 | []+TT | 100 kHz |
| ± 0.5-5 | []+TT | 100 kHz |
| ± 5-10 | []+TT | 100 kHz |
| NOTE 1: TT for each frequency and channel bandwidth is specified in Table 6.5E.2.3.1.5-1. | | |

6.5E.2.3.1.5.2 Requirements for network signalling value "NS\_52"

When "NS\_52" is indicated in the cell, the power of any NR V2X UE emission shall fulfil requirements in Table 6.5E.2.3.1.5.2-1.

Table 6.5E.2.3.1.5.2-1: Additional spectrum mask requirements for 40MHz channel bandwidth (fc = 5885MHz)

|  |  |  |
| --- | --- | --- |
| ΔfOOB (MHz) | Emission Limit (dBm) | Measurement Bandwidth |
| ±0-2 | -32+TT | 100kHz |
| ±2-10 | -36+TT | 100kHz |
| ±10-20 | -38+TT | 100kHz |
| ±20-40 | -43+TT | 100kHz |
| ±40-100 | -50+TT | 100kHz |
| NOTE 1: TT for each frequency and channel bandwidth is specified in Table 6.5E.2.3.1.5-1. | | |

##### 6.5E.2.3.1D Additional Spectrum emission mask for V2X / non-concurrent operation / SL-MIMO

6.5E.2.3.1D.1 Test purpose

To verify that the power of NR V2X UE emission shall not exceed specified level for the specified channel bandwidth under the deployment scenarios where additional requirements are specified.

6.5E.2.3.1D.2 Test applicability

This test case applies to all types of NR UE release 16 and forward that support NR V2X sidelink MIMO communication with non-concurrent operation.

6.5E.2.3.1D.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 6.5E.2.1 and 6.5E.2.3.0.

6.5E.2.3.1D.4 Test description

6.5E.2.3.1D.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, test channel bandwidths and sub-carrier spacing based on NR operating bands specified in Table 5.2E.1-1 and Table 5.3.5-1. All of these configurations shall be tested with applicable test parameters for each combination of test channel bandwidth and sub-carrier spacing, and are shown in clause 6.2E.3.1D.4.1. The details of the V2X reference measurement channels (RMCs) are specified in Annexes A.7.5 and the GNSS configuration in TS 38.508-1 [5] subclause 4.11.

Table 6.5E.2.3.1D.4.1-1: Void

1. Connect the SS and GNSS simulator to the UE antenna connectors as shown in TS 38.508-1 [5] Annex A, Figure A.3.1.9.2 for TE diagram and section A.3.2.7 for UE diagram.

2. The parameter settings for the V2X sidelink transmission over PC5 are pre-configured according to TS 38.508-1 [5] subclause 4.10. Message content exceptions are defined in clause 6.5E.2.3.1D.4.3.

3. The V2X Reference Measurement Channel is set according to clause 6.2E.3.1D.4.1.

4. The GNSS simulator is configured for Scenario #1: static in Geographical area #1, as defined in TS36.508 [25] Table 4.11.2-2. Geographical area #1 is also pre-configured in the UE.

5. Propagation conditions are set according to Annex B.0.

6. Ensure the UE is in state 4-A as defined in TS 38.508-1 [4], subclause 4.4A using generic procedure parameter Sidelink (On), Cast Type (Unicast), GNSS Sync (On) and Transmit Mode with SL-MIMO.

6.5E.2.3.1D.4.2 Test procedure

1. The UE starts to perform the NR sidelink communication according to SL-PreconfigurationNR with 2-layer MIMO codebook TPMI 0. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the NR sidelink RMC.

2. Measure the sum of mean power of the UE at each transmit antenna connector in the channel bandwidth according to the test configuration from clause 6.2E.3.1D.4.1, which shall meet the requirements described in clause 6.2E.3.1D.5. The period of the measurement shall be at least the continuous duration of one sub-frame (1ms) excluding guard symbols.

3. Measure the power of the transmitted signal at each transmit antenna connector with a measurement filter of bandwidths according to Table 6.5E.2.3.1D.5.1-1 or Table 6.5E.2.3.1D.5.2-1 and using a rms detector. If the sweep count is higher than one, the trace mode shall be average. The centre frequency of the filter shall be stepped in continuous steps according to the same table. The measured power shall be recorded for each step. The measurement period shall capture the active TSs.

6.5E.2.3.1D.4.3 Message contents

Message contents are according to TS 38.508-1 [5] subclause 4.10 with following exceptions.

6.5E.2.3.1D.5 Test requirement

Table 6.5E.2.3.1D.5-1: Test Tolerance

|  |  |  |
| --- | --- | --- |
|  | f ≤ 3.0GHz | 3.0GHz < f ≤ 6.0GHz |
| BW ≤ 40MHz | 1.5 dB | 1.8 dB |

6.5E.2.3.1D.5.1 Requirements for network signalling value "NS\_33"

When "NS\_33" is indicated in the cell or pre-configured radio parameter, the power of any NR V2X UE emission at each antenna connector shall not exceed the levels specified in Table 6.5E.2.3.1D.5.1-1.

Table 6.5E.2.3.1D.5.1-1: Additional spectrum mask requirements for 10MHz channel bandwidth

|  |  |  |
| --- | --- | --- |
| Spectrum emission limit (dBm EIRP)/ Channel bandwidth | | |
| ΔfOOB  (MHz) | 10 MHz | Measurement bandwidth |
| ± 0-0.5 | []+TT | 100 kHz |
| ± 0.5-5 | []+TT | 100 kHz |
| ± 5-10 | []+TT | 100 kHz |
| NOTE 1: TT for each frequency and channel bandwidth is specified in Table 6.5E.2.3.1D.5-1. | | |

6.5E.2.3.1D.5.2 Requirements for network signalling value "NS\_52"

When "NS\_52" is indicated in the cell, the power of any NR V2X UE emission at each antenna connector shall fulfil requirements in Table 6.5E.2.3.1D.5.2-1.

Table 6.5E.2.3.1D.5.2-1: Additional spectrum mask requirements for 40MHz channel bandwidth (fc = 5885MHz)

|  |  |  |
| --- | --- | --- |
| ΔfOOB (MHz) | Emission Limit (dBm) | Measurement Bandwidth |
| ±0-2 | -32+TT | 100kHz |
| ±2-10 | -36+TT | 100kHz |
| ±10-20 | -38+TT | 100kHz |
| ±20-40 | -43+TT | 100kHz |
| ±40-100 | -50+TT | 100kHz |
| NOTE 1: TT for each frequency and channel bandwidth is specified in Table 6.5E.2.3.1D.5-1. | | |

#### 6.5E.2.4 Adjacent channel leakage ratio for V2X

##### 6.5E.2.4.1 Adjacent channel leakage ratio for V2X / non-concurrent operation

Editor’s Note: This clause is incomplete for PSFCH and PSBCH measurement. The following aspects are either missing or not yet determined:

- Measurement period of PSFCH and PSBCH is FFS.

6.5E.2.4.1.1 Test purpose

To verify that V2X UE transmitter does not cause unacceptable interference to adjacent channels in terms of Adjacent Channel Leakage Power Ratio (ACLR) when UE is configured for NR V2X sidelink transmissions non-concurrent with NR uplink transmissions.

6.5E.2.4.1.2 Test applicability

This test case applies to all types of NR UE release 16 and forward that support NR V2X sidelink communication with non-concurrent operation.

6.5E.2.4.1.3 Minimum conformance requirements

Adjacent Channel Leakage power Ratio (ACLR) is the ratio of the filtered mean power centred on the assigned channel frequency to the filtered mean power centred on an adjacent channel frequency.

For NR V2X UE, the existing ACLR requirement for NR uplink transmission in clause 6.5.2.4 are applied for NR V2X UE for NR V2X operating bands in 5.2E.1-1.

The normative reference for this requirement is TS 38.101-1 [2] clause 6.5E.2.4.

6.5E.2.4.1.4 Test description

6.5E.2.4.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, test channel bandwidths and sub-carrier spacing based on NR operating bands specified in Table 5.2E.1-1 and Table 5.3.5-1. All of these configurations shall be tested with applicable test parameters for each combination of test channel bandwidth and sub-carrier spacing, and are shown in the test configuration tables in clause 6.2E.2.1.4. The details of the V2X reference measurement channels (RMCs) are specified in Annexe A.7.5 and the GNSS configuration in TS 38.508-1 [5] subclause 4.11.

Table 6.5E.2.4.1.4.1-1: Void

1. Connect the SS and GNSS simulator to the UE antenna connectors as shown in TS 38.508-1 [5] Annex A, Figure A.3.1.9.1 for TE diagram and section A.3.2.7 for UE diagram.

2. The parameter settings for the NR sidelink transmission over PC5 are pre-configured according to TS 38.508-1 [5] subclause 4.10. Message content exceptions are defined in clause 6.5E.2.4.1.4.3.

3. The V2X Reference Measurement Channel is set according to the test configuration tables in clause 6.2E.2.1.4.1.

4. The GNSS simulator is configured for Scenario #1: static in Geographical area #1, as defined in TS 38.508-1 [5] Table 4.11.2-2. Geographical area #1 is also pre-configured in the UE.

5. Propagation conditions are set according to Annex B.0.

6.5E.2.4.1.4.2 Test procedure

Subtest 1: PSCCH/PSSCH

1. Ensure the UE is in state Out\_of\_Coverage with generic procedure parameters Sidelink *On*, Test Loop Function *On* with UE test loop mode E closed for *Transmit Mode* according to TS 38.508-1 [5] clause 4.5.

2. The UE starts to perform the NR sidelink communication according to *SL-PreconfigurationNR*. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the NR sidelink RMC.

3. Measure the mean power of the UE in the channel bandwidth of the radio access mode according to the test configuration from Table 6.2E.2.1.4.1-1, which shall meet the requirements described in Table 6.2E.2.1.5-1 for Power Class 3 UEs. The period of measurement shall be at least continuous duration of one active sub-frame (1ms) excluding guard symbols.

4. Measure the rectangular filtered mean power for assigned NR V2X sidelink using a rms detector. If the sweep count is higher than one, the trace mode shall be average.

5. Measure the rectangular filtered mean power of the first NR adjacent channel on both lower and upper side of the assigned NR V2X sidelink channel using a rms detector, respectively. If the sweep count is higher than one, the trace mode shall be average.

6. Calculate the ratios of the power between the values measured in step 4 over step 5 for lower and upper NRACLR.

Subtest 2: PSFCH

1. Ensure the UE is in state Out\_of\_Coverage with generic procedure parameters Sidelink *On*, Cast type *Unicast*, Test Loop Function *On* with UE test loop mode E closed for *Receive Mode* according to TS 38.508-1 [5] clause 4.5.

2. The UE starts to perform the NR sidelink reception according to *SL-PreconfigurationNR*.

3. The UE’s PSFCH transmission occasion is on slot n according to Table 6.2E.2.1.4.1-2. SS transmits PSSCH on combination of slot and subchannel as below:

a) Test ID 1: slot n-6, Lowest sub-channel

b) Test ID 2: slot n-3, Highest sub-channel

c) Test ID 3: slot n-6 and n-5, Lowest sub-channel

d) Test ID 4: slot n-4 and n-3, Highest sub-channel

e) Test ID 5: slot n-6, Highest sub-channel and slot n-3, Highest sub-channel

4. Measure the mean power of the UE on slot n in the channel bandwidth according to the test configuration from Table 6.2E.2.1.4.1-2, which shall meet the requirements described in Table 6.2E.2.1.5-2 for Power Class 3 UEs. The period of measurement is FFS.

5. Measure the rectangular filtered mean power for assigned NR V2X sidelink using a rms detector. If the sweep count is higher than one, the trace mode shall be average.

6. Measure the rectangular filtered mean power of the first NR adjacent channel on both lower and upper side of the assigned NR V2X sidelink channel using a rms detector, respectively. If the sweep count is higher than one, the trace mode shall be average.

7. Calculate the ratios of the power between the values measured in step 5 over step 6 for lower and upper NRACLR.

Subtest 3: S-SSB

1. Ensure the UE is in state Out\_of\_Coverage with generic procedure parameters Sidelink *On* according to TS 38.508-1 [5] clause 4.5. The UE is synchronized to GNSS,

2. The UE transmits PSBCH according *SL-PreconfigurationNR*.

3. Measure the mean power of the S-SSB in the channel bandwidth according to the test configuration from Table 6.2E.2.1.4.1-3, which shall meet the requirements described in Table 6.2E.2.1.5-3 for Power Class 3 UEs. The period of measurement is FFS.

4. Measure the rectangular filtered mean power for assigned NR V2X sidelink using a rms detector. If the sweep count is higher than one, the trace mode shall be average.

5. Measure the rectangular filtered mean power of the first NR adjacent channel on both lower and upper side of the assigned NR V2X sidelink channel using a rms detector, respectively. If the sweep count is higher than one, the trace mode shall be average.

6. Calculate the ratios of the power between the values measured in step 4 over step 5 for lower and upper NRACLR.

6.5E.2.4.1.4.3 Message contents

Message contents are according to TS 38.508-1 [5] subclause 4.10.

6.5E.2.4.1.5 Test requirement

The measured mean power of V2X UE in the channel bandwidth, derived in step 6 of Subtest 1, step 7 of Subtest 2 and step 6 of Subtest 3, shall fulfil requirements in clause 6.2E.2.1.5, and if the measured adjacent channel power is greater than –50 dBm then the measured NR ACLR, derived in step 5, shall be higher than the limits in Table 6.5E.2.4.1.5-2.

Table 6.5E.2.4.1.5-1: Measurement bandwidth

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| NR channel bandwidth / NR ACLR measurement bandwidth | | | | | | | | | | | | |
|  | 5 MHz | 10 MHz | 15 MHz | 20 MHz | 25 MHz | 30 MHz | 40 MHz | 50 MHz | 60 MHz | 80 MHz | 90 MHz | 100 MHz |
| NR ACLR measurement bandwidth | 4.515 | 9.375 | 14.235 | 19.095 | 23.955 | 28.815 | 38.895 | 48.615 | 58.35 | 78.15 | 88.23 | 98.31 |

Table 6.5E.2.4.1.5-2: NR ACLR requirement for V2X / non-concurrent operation

|  |  |  |  |
| --- | --- | --- | --- |
|  | Power class 1 | Power class 2 | Power class 3 |
| NR ACLR |  |  | 30 - TT dB |
| NOTE 1: TT for each frequency and channel bandwidth is specified in Table 6.5E.2.4.1.5-3. | | | |

Table 6.5E.2.4.1.5-3: Test Tolerance

FFS

##### 6.5E.2.4.1D Adjacent channel leakage ratio for V2X / non-concurrent operation / SL-MIMO

Editor’s Note:

- Test config table is FFS

- Uplink RMC is TBD in TS 38.101-1

- Connection diagram is TBD

- Preconfiguration is TBD in 38.508-1

- Test state and generic procedure are TBD in 38.508-1

6.5E.2.4.1D.1 Test purpose

To verify that V2X UE transmitter does not cause unacceptable interference to adjacent channels in terms of Adjacent Channel Leakage Power Ratio (ACLR) when UE is configured for NR V2X sidelink MIMO transmissions non-concurrent with NR uplink transmissions.

6.5E.2.4.1D.2 Test applicability

This test case applies to all types of NR UE release 16 and forward that support NR V2X sidelink MIMO communication with non-concurrent operation.

6.5E.2.4.1D.3 Minimum conformance requirements

For NR V2X UE with two transmit antenna connectors, the requirements specified for single carrier shall apply to each transmit antenna connector. The requirements shall be met with SL MIMO configurations described in clause 6.2D.1.

If V2X UE transmits on one antenna connector at a time, the requirements specified for single carrier shall apply to the active antenna connector.

The normative reference for this requirement is TS 38.101-1 [2] clause 6.5E.2.4.

6.5E.2.4.1D.4 Test description

6.5E.2.4.1D.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, test channel bandwidths and sub-carrier spacing based on NR operating bands specified in Table 5.3.5-1. All of these configurations shall be tested with applicable test parameters for each combination of test channel bandwidth and sub-carrier spacing, and are shown in the test configuration tables in clause 6.2E.2.1D.4.1. The details of the V2X reference measurement channels (RMCs) are specified in Annexes TBD.

Table 6.5E.2.4.1D.4.1-1: Void

1. Connect the SS and GNSS simulator to the UE antenna connectors as shown in TS 38.508-1 [5] Annex A, Figure TBD for TE diagram and section TBD for UE diagram.

2. The parameter settings for the V2X sidelink transmission over PC5 are pre-configured according to TS 38.508-1 [5] subclause TBD. Message content exceptions are defined in clause 6.5E.2.4.1.4.3.

3. The V2X Reference Measurement Channel is set according to the test configuration tables in clause 6.2E.2.1D.4.1.

4. The GNSS simulator is configured for Scenario #1: static in Geographical area #1, as defined in TS36.508 [25] Table 4.11.2-2. Geographical area #1 is also pre-configured in the UE.

5. Propagation conditions are set according to Annex B.0.

6. Ensure the UE is in state TBD.

6.5E.2.4.1D.4.2 Test procedure

1. The V2X UE schedules the V2X RMC with transmission power at PUMAX level according to *SL-V2X-Preconfiguration* which is in line with the test configuration in the test configuration tables in clause 6.2E.2.1D.4.1;

2. Measure the sum of mean power of the UE at both antenna connector in the channel bandwidth of the radio access mode according to the test configuration, as measured in 6.2E.2.1D.4.2, which shall meet the requirements in clause 6.2E.2.1D.5 as appropriate.

3. Measure the rectangular filtered mean power for assigned NR V2X sidelink at each antenna connector using a rms detector. If the sweep count is higher than one, the trace mode shall be average.

4. Measure the rectangular filtered mean power of the first NR adjacent channel on both lower and upper side of the assigned NR V2X sidelink channel at each antenna connector using a rms detector, respectively. If the sweep count is higher than one, the trace mode shall be average.

5. Calculate the ratios of the power between the values measured in step 3 over step 4 for lower and upper NRACLR for each antenna connector.

6.5E.2.4.1D.4.3 Message contents

Message contents are according to TS 38.508-1 [5] subclause 4.6 and 5.4.

6.5E.2.4.1D.5 Test requirement

The measured sum of mean power of V2X UE at both antenna connector in the channel bandwidth, derived in step 2, shall fulfil requirements in clause 6.2E.2.1D.5, and if the measured adjacent channel power is greater than –50 dBm then the measured NR ACLR for each antenna connector, derived in step 5, shall be higher than the limits in Table 6.5E.2.4.1D.5-2.

Table 6.5E.2.4.1D.5-1: Measurement bandwidth

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| NR channel bandwidth / NR ACLR measurement bandwidth | | | | | | | | | | | | |
|  | 5 MHz | 10 MHz | 15 MHz | 20 MHz | 25 MHz | 30 MHz | 40 MHz | 50 MHz | 60 MHz | 80 MHz | 90 MHz | 100 MHz |
| NR ACLR measurement bandwidth | 4.515 | 9.375 | 14.235 | 19.095 | 23.955 | 28.815 | 38.895 | 48.615 | 58.35 | 78.15 | 88.23 | 98.31 |

Table 6.5E.2.4.1D.5-2: NR ACLR requirement for V2X / non-concurrent operation / SL-MIMO

|  |  |  |  |
| --- | --- | --- | --- |
|  | Power class 1 | Power class 2 | Power class 3 |
| NR ACLR |  |  | 30 - TT dB |
| NOTE 1: TT for each frequency and channel bandwidth is specified in Table 6.5E.2.4.1D.5-3. | | | |

Table 6.5E.2.4.1D.5-3: Test Tolerance

FFS

### 6.5E.3 Spurious emissions for V2X

#### 6.5E.3.1 General spurious emissions for V2X

#### 6.5E.3.2 Spurious emissions for UE co-existence for V2X

##### 6.5E.3.2.1 Spurious emissions for UE co-existence for V2X / non-concurrent operation

Editor’s Note:

- Test config table is FFS

6.5E.3.2.1.1 Test purpose

To verify that UE transmitter does not cause unacceptable interference to co-existing systems for the specified bands which has specific requirements in terms of transmitter spurious emissions.

6.5E.3.2.1.2 Test applicability

This test case applies to all types of NR UE release 16 and forward that support NR V2X sidelink communication with non-concurrent operation.

6.5E.3.2.1.3 Minimum conformance requirements

When UE is configured for NR V2X sidelink transmissions non-concurrent with NR uplink transmissions for NR V2X operating bands specified in Table 5.2E.1-1, the requirements in clause 6.5.3.2 shall apply for NR V2X sidelink transmission.

The normative reference for this requirement is TS 38.101-1 [2] clause 6.5E.3.2.

6.5E.3.2.1.4 Test description

6.5E.3.2.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, test channel bandwidths and sub-carrier spacing based on NR operating bands specified in Table 5.2E.1-1 and Table 5.3.5-1. All of these configurations shall be tested with applicable test parameters for each combination of test channel bandwidth and sub-carrier spacing, and are shown in table 6.5E.3.2.1.4.1-1. The details of the V2X reference measurement channels (RMCs) are specified in Annexes A.7.5 and the GNSS configuration in TS 38.508-1 [5] subclause 4.11.

Table 6.5E.3.2.1.4.1-1: Test Configuration Table

FFS

1. Connect the SS and GNSS simulator to the UE antenna connectors as shown in TS 38.508-1 [5] Annex A, Figure A.3.1.9.1 for TE diagram and section A.3.2.7 for UE diagram.

2. The parameter settings for the NR sidelink transmission over PC5 are pre-configured according to TS 38.508-1 [5] subclause 4.10. Message content exceptions are defined in clause 6.5E.3.2.1.4.3.

3. The V2X Reference Measurement Channel is set according to Table 6.5E.3.2.1.4.1-1.

4. The GNSS simulator is configured for Scenario #1: static in Geographical area #1, as defined in TS 38.508-1 [5] Table 4.11.2-2. Geographical area #1 is also pre-configured in the UE.

5. Propagation conditions are set according to Annex B.0.

6. Ensure the UE is in state Out\_of\_Coverage with generic procedure parameters Sidelink *On*, Test Loop Function *On* with UE test loop mode E closed for *Transmit Mode* according to TS 38.508-1 [5] clause 4.5.

6.5E.3.2.1.4.2 Test procedure

1. The V2X UE schedules the V2X RMC with transmission power at PUMAX level according to *SL-PreconfigurationNR* which is in line with the test configuration in Table 6.5E.3.2.1.4.1-1.

2. Measure the power of the transmitted signal with a measurement filter of bandwidths according to Table 6.5.3.2.3-2. The centre frequency of the filter shall be stepped in contiguous steps according to Table 6.5.3.2.3-2. The measured power shall be verified for each step. The measurement period shall capture the active time slots. During measurement the spectrum analyser shall be set to 'Detector' = RMS. If the sweep count is higher than one, the trace mode shall be average.

6.5E.3.2.1.4.3 Message contents

Message contents are according to TS 38.508-1 [5] subclause 4.10.

6.5E.3.2.1.5 Test requirement

Unless otherwise stated, the spurious emission limits apply for the frequency ranges that are more than ΔfOOB (MHz) in Tables 6.5.3.2.3-2 from the edge of the channel bandwidth. The spurious emission limits in Tables 6.5.3.2.3-2 apply for all transmitter band configurations (NRB) and channel bandwidths.

The measured average power of spurious emission, derived in step 2, shall not exceed the described value in Table 6.5.3.2.3-2.

##### 6.5E.3.2.1D Spurious emissions for UE co-existence for V2X / non-concurrent operation / SL-MIMO

Editor’s Note:

- Test config table is FFS

- Uplink RMC is TBD in TS 38.101-1

- Connection diagram is TBD

- Preconfiguration is TBD in 38.508-1

- Test state and generic procedure are TBD in 38.508-1

6.5E.3.2.1D.1 Test purpose

To verify that UE transmitter does not cause unacceptable interference to co-existing systems for the specified bands which has specific requirements in terms of transmitter spurious emissions.

6.5E.3.2.1D.2 Test applicability

This test case applies to all types of NR UE release 16 and forward that support NR V2X sidelink MIMO communication with non-concurrent operation.

6.5E.3.2.1D.3 Minimum conformance requirements

For NR V2X UE with two transmit antenna connectors, the requirements specified for single carrier shall apply to each transmit antenna connector. The requirements shall be met with the SL MIMO configurations described in clause 6.2D.1.

The normative reference for this requirement is TS 38.101-1 [2] clause 6.5E.3.2.

6.5E.3.2.1D.4 Test description

6.5E.3.2.1D.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, test channel bandwidths and sub-carrier spacing based on NR operating bands specified in Table 5.3.5-1. All of these configurations shall be tested with applicable test parameters for each combination of test channel bandwidth and sub-carrier spacing, and are shown in table 6.5E.3.2.1D.4.1-1. The details of the V2X reference measurement channels (RMCs) are specified in Annexes TBD.

Table 6.5E.3.2.1D.4.1-1: Test Configuration Table

FFS

1. Connect the SS and GNSS simulator to the UE antenna connectors as shown in TS 38.508-1 [5] Annex A, Figure TBD for TE diagram and section TBD for UE diagram.

2. The parameter settings for the V2X sidelink transmission over PC5 are pre-configured according to TS 38.508-1 [5] subclause TBD. Message content exceptions are defined in clause 6.5E.3.2.1D.4.3.

3. The V2X Reference Measurement Channel is set according to Table 6.5E.3.2.1D.4.1-1.

4. The GNSS simulator is configured for Scenario #1: static in Geographical area #1, as defined in TS36.508 [25] Table 4.11.2-2. Geographical area #1 is also pre-configured in the UE.

5. Propagation conditions are set according to Annex B.0.

6. Ensure the UE is in state TBD.

6.5E.3.2.1D.4.2 Test procedure

1. The V2X UE schedules the V2X RMC with transmission power at PUMAX level according to *SL-V2X-Preconfiguration* which is in line with the test configuration in Table 6.5E.3.2.1D.4.1-1.

2. Measure the power of the transmitted signal at each antenna connector with a measurement filter of bandwidths according to Table 6.5.3.2.3-2. The centre frequency of the filter shall be stepped in contiguous steps according to Table 6.5.3.2.3-2. The measured power shall be verified for each step. The measurement period shall capture the active time slots. During measurement the spectrum analyser shall be set to 'Detector' = RMS. If the sweep count is higher than one, the trace mode shall be average.

6.5E.3.2.1D.4.3 Message contents

Message contents are according to TS 38.508-1 [5] subclause 4.6 and 5.4.

6.5E.3.2.1D.5 Test requirement

Unless otherwise stated, the spurious emission limits apply for the frequency ranges that are more than ΔfOOB (MHz) in Tables 6.5.3.2.3-2 from the edge of the channel bandwidth. The spurious emission limits in Tables 6.5.3.2.3-2 apply for all transmitter band configurations (NRB) and channel bandwidths.

The measured average power of spurious emission at each antenna connector, derived in step 2, shall not exceed the described value in Table 6.5.3.2.3-2.

#### 6.5E.3.3 Additional spurious emissions requirements for V2X

##### 6.5E.3.3.0 Minimum conformance requirements

##### 6.5E.3.3.0.1 Requirements for network signalling value "NS\_33"

Table 6.5E.3.3.0.1-1: Additional requirements for "NS\_33"

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Protected band | | Frequency range (MHz) | | | Maximum Level (EIRP2) | MBW (MHz) | NOTE |
| Frequency range | 5925 | | - | 5950 | -30 | 1 | 1 |
| Frequency range | 5815 | | - | 5855 | -30 | 1 | 3 |
| NOTE 1: In the frequency range x-5950MHz, SE requirement of -30dBm/MHz should be applied; where x = max (5925, fc + 15), where fc is the channel centre frequency.  NOTE 2: The EIRP requirement is converted to conducted requirement depend on the supported post antenna connector gain Gpost connector declared by the UE following the principle described in annex I in [11].  NOTE 3: Resolution BW is 10% of the measurement BW and the result should be integrated to achieve the measurement bandwidth. The sweep time shall be set larger than (symbol length)\*(number of points in sweep) to improve the measurement accuracy. | | | | | | | |

When "NS\_33" is configured from pre-configured radio parameters or the cell, and the indication from upper layers has indicated that the UE is within the protection zone of CEN DSRC devices or HDR DSRC devices, the power of any NR V2X UE emission shall fulfil either one of the two sets of conditions.

Table 6.5E.3.3.0.1-2: Requirements for spurious emissions to protect CEN DSRC for V2X UE

|  |  |  |
| --- | --- | --- |
|  | Maximum Transmission Power (dBm EIRP1) | Emission Limit in Frequency Range 5795-5815 (dBm/MHz EIRP1) |
| Condition 1 | 10 | -65 |
| Condition 2 | 10 | -45 |
| NOTE 1: The EIRP requirement is converted to conducted requirement depend on the supported post antenna connector gain Gpost connector declared by the UE following the principle described in annex I in [11]. | | |

The normative reference for this requirement is TS 38.101-1 [2] clause 6.5E.3.4.

##### 6.5E.3.3.1 Additional spurious emissions requirements for V2X / non-concurrent operation

6.5E.3.3.1.1 Test purpose

To verify that UE transmitter does not cause unacceptable interference to other channels or other systems in terms of transmitter spurious emissions under the deployment scenarios where additional requirements are specified.

6.5E.3.3.1.2 Test applicability

This test case applies to all types of NR UE release 16 and forward that support NR V2X sidelink communication with non-concurrent operation.

6.5E.3.3.1.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 6.5E.2.3.0.

Table 6.5E.3.3.1.3-1: Void

Table 6.5E.3.3.1.3-2: Void

6.5E.3.3.1.4 Test description

6.5E.3.3.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, test channel bandwidths and sub-carrier spacing based on NR operating bands specified in Table 5.2E.1-1 and Table 5.3.5-1. All of these configurations shall be tested with applicable test parameters for each combination of test channel bandwidth and sub-carrier spacing, and are shown in clause 6.2E.3.1.4. The details of the V2X reference measurement channels (RMCs) are specified in Annexes A.7.5 and the GNSS configuration in TS 38.508-1 [5] subclause 4.11.

Table 6.5E.3.3.1.4.1-1: Void

1. Connect the SS and GNSS simulator to the UE antenna connectors as shown in TS 38.508-1 [5] Annex A, Figure A.3.1.9.1 for TE diagram and section A.3.2.7 for UE diagram.

2. The parameter settings for the NR sidelink transmission over PC5 are pre-configured according to TS 38.508-1 [5] subclause 4.10. Message content exceptions are defined in clause 6.5E.3.3.1.4.3.

3. The V2X Reference Measurement Channel is set according to clause 6.2E.3.1.4.1.

4. The GNSS simulator is configured for Scenario #1: static in Geographical area #1, as defined in TS 38.508-1 [5] Table 4.11.2-2. Geographical area #1 is also pre-configured in the UE.

5. Propagation conditions are set according to Annex B.0.

6. Ensure the UE is in state Out\_of\_Coverage with generic procedure parameters Sidelink *On*, Test Loop Function *On* with UE test loop mode E closed for *Transmit Mode* according to TS 38.508-1 [5] clause 4.5.

6.5E.3.3.1.4.2 Test procedure

Subtest 1: PSCCH/PSSCH

1. Ensure the UE is in state Out\_of\_Coverage with generic procedure parameters Sidelink On, Test Loop Function On with UE test loop mode E closed for Transmit Mode according to TS 38.508-1 [5] clause 4.5.

2. The UE starts to perform the NR sidelink communication according to SL-PreconfigurationNR. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the NR sidelink RMC.

3. Measure the power of the transmitted signal with a measurement filter of bandwidths according to Table 6.5E.3.3.1.5.1-1 and using a rms detector. The centre frequency of the filter shall be stepped in continuous steps according to the same table. The measured power shall be recorded for each step. The measurement period shall capture the active TSs.

Subtest 2: PSFCH

1. Ensure the UE is in state Out\_of\_Coverage with generic procedure parameters Sidelink On, Cast type Unicast, Test Loop Function On with UE test loop mode E closed for Receive Mode according to TS 38.508-1 [5] clause 4.5.

2. The UE starts to perform the NR sidelink reception according to SL-PreconfigurationNR.

3. The UE’s PSFCH transmission occasion is on slot n according to Table 6.2E.3.1.4.1-2. SS transmits PSSCH on combination of slot and subchannel as below:

a) Test ID 1: slot n-6, Lowest sub-channel

b) Test ID 2, 4, 5 and 6: slot n-6, Lowest sub-channel and slot n-3, Highest sub-channel

c) Test ID 3: slot n-3, Highest sub-channel

4. Measure the power of the transmitted signal with a measurement filter of bandwidths according to Table 6.5E.3.3.1.5.1-1 and using a rms detector. The centre frequency of the filter shall be stepped in continuous steps according to the same table. The measured power shall be recorded for each step. The measurement period shall capture the active TSs.

Subtest 3: S-SSB

1. Ensure the UE is in state Out\_of\_Coverage with generic procedure parameters Sidelink On according to TS 38.508-1 [5] clause 4.5. The UE is synchronized to GNSS,

2. The UE transmits PSBCH according SL-PreconfigurationNR.

3. Measure the power of the transmitted signal with a measurement filter of bandwidths according to Table 6.5E.3.3.1.5.1-1 and using a rms detector. The centre frequency of the filter shall be stepped in continuous steps according to the same table. The measured power shall be recorded for each step. The measurement period shall capture the active TSs.

6.5E.3.3.1.4.3 Message contents

Message contents are according to TS 38.508-1 [5] subclause 4.10 with following exceptions.

For "NS\_33" see message contents for A-MPR test case in clause 6.2E.3.1.4.3.1.

Table 6.5E.3.3.1.4.3-1: Void

6.5E.3.3.1.5 Test requirement

6.5E.3.3.1.5.1 Message contents exceptions (network signalling value "NS\_33")

The transmitted spurious emission power derived in step 3 of subtest 1, step 4 of subtest 2 and step 3 of subtest 3 should be converted to EIRP value depend on the supported post antenna connector gain Gpost connector declared by the UE following the principle described in annex I in [11]. The EIPR value should not exceed test requirements in Table 6.5E.3.3.1.5.1-1.

Table 6.5E.3.3.1.5.1-1: Test requirements for "NS\_33"

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Protected band | Frequency range (MHz) | | | Maximum Level (EIRP2) | MBW (MHz) |
| Frequency range | 5925 | - | 5950 | -30 | 1 |
| Frequency range | 5815 | - | 5855 | -30 | 1 |

## 6.5F Output RF spectrum emissions for shared spectrum channel access

### 6.5F.1 Occupied bandwidth for shared spectrum channel access

FFS

Editor’s Note: This test is incomplete. The following aspects are not yet determined:

- Test state and generic procedure are TBD in 38.508-1

- MU and TT for > 5.925 GHz

- Message exception for NR-U

6.5F.1.1 Test purpose

To verify that the UE occupied bandwidth for all transmission bandwidth configurations supported by the UE are less than their specific limits.

6.5F.1.2 Test applicability

This test applies to all types of NR UE release 16 and forward that support NR standalone shared spectrum channel access.

6.5F.1.3 Minimum conformance requirements

Occupied bandwidth is defined as the bandwidth containing 99 % of the total integrated mean power of the transmitted spectrum on the assigned channel. The occupied bandwidth for all transmission bandwidth configurations (Resources Blocks) shall be less than the channel bandwidth specified in Table 6F.5.1.3-1.

Table 6.5F.1.3-1: Occupied channel bandwidth

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | NR channel bandwidth | | | | |
|  | 10 MHz | 20 MHz | 40 MHz | 60 MHz | 80 MHz |
| Occupied channel bandwidth (MHz) | 10 | 20 | 40 | 60 | 80 |

The normative reference for this requirement is TS 38.101-1 [2] clause 6.5F.1.

6.5F.1.4 Test description

6.5F.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, test channel bandwidths and sub-carrier spacing based on NR operating bands specified in table 5.3.5-1. All of these configurations shall be tested with applicable test parameters for each combination of channel bandwidth and sub-carrier spacing, are shown in table 6.5F.1.4.1-1. The details of the uplink reference measurement channels (RMCs) are specified in Annexes A.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Table 6.5F.1.4.1-1: Test Configuration Table

|  |  |  |  |
| --- | --- | --- | --- |
| Initial Conditions | | | |
| Test Environment as specified in TS 38.508-1 [5] subclause 4.1 | | Normal | |
| Test Frequencies as specified in TS 38.508-1 [5] subclause 4.3.1 | | Mid range | |
| Test Channel Bandwidths as specified in TS 38.508-1 [5] subclause 4.3.1 | | All | |
| Test SCS as specified in Table 5.3.5-1 | | Lowest | |
| Test Parameters | | | |
| Test ID | Downlink Configuration | Uplink Configuration | |
|  | N/A for occupied bandwidth test case | Modulation | RB allocation (NOTE 1) |
| 1 | CP-OFDM QPSK | Outer\_full |
| NOTE 1: The specific configuration of each RB allocation is defined in Table 6.1-1. | | | |

1. Connect the SS to the UE antenna connectors as shown in TS 38.508-1 [5] Annex A, Figure A.3.1.1.1 for TE diagram and section A.3.2 for UE diagram.

2. The parameter settings for the cell are set up according to TS 38.508-1 [5] subclause 4.4.3.

3. Downlink signals are initially set up according to Annex C.0, C.1, C.2, and uplink signals according to Annex G.0, G.1, G.2, G.3.0.

4. The UL Reference Measurement channels are set according to Table 6.5F.1.4.1-1.

5. Propagation conditions are set according to Annex B.0

6. Ensure the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On,* Test Mode *On* and Test Loop Function *On* according to TS 38.508-1 [5] clause 4.5. Message contents are defined in clause 6.5F.1.4.3

6.5F.1.4.2 Test procedure

1. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0\_1 for C\_RNTI to schedule the UL RMC according to Table 6.5F.1.4.1-1. Since the UL has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC.

2. Send continuously power control "up" commands to the UE until the UE transmits at PUMAX level. Allow at least 200ms for the UE to reach PUMAX level.

3. Measure the power spectrum distribution within two times or more range over the requirement for Occupied Bandwidth specification centring on the current carrier frequency. The characteristics of the filter shall be approximately Gaussian (typical spectrum analyser filter). Other methods to measure the power spectrum distribution are allowed. The measuring duration is at least 1ms over consecutive active uplink slots.

4. Calculate the total power within the range of all frequencies measured in step 3 and save this value as "Total power".

5. Identify the measurement window whose centre is aligned on the centre of the channel for which the sum of the power measured is 99% of the "Total power".

6. The "Occupied Bandwidth" is the width of the measurement window obtained in step 5.

6.5F.1.4.3 Message contents

Message contents are according to TS 38.508-1 [5] subclause 4.6.

6.5F.1.5 Test requirement

The measured Occupied Bandwidth shall not exceed values in Table 6.5F.1.5-1.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Table 6.5F.1.5-1: Occupied channel bandwidth | NR channel bandwidth | | | | |
|  | 10 MHz | 20 MHz | 40 MHz | 60 MHz | 80 MHz |
| Occupied channel bandwidth (MHz) | 10 | 20 | 40 | 60 | 80 |

### 6.5F.2 Out of band emission for shared spectrum channel access

#### 6.5F.2.1 General

The Out of band emissions are unwanted emissions immediately outside the assigned channel bandwidth resulting from the modulation process and non-linearity in the transmitter but excluding spurious emissions. This out of band emission limit is specified in terms of a spectrum emission mask and an adjacent channel leakage power ratio.

To improve measurement accuracy, sensitivity and efficiency, the resolution bandwidth may be smaller than the measurement bandwidth. When the resolution bandwidth is smaller than the measurement bandwidth, the result should be integrated over the measurement bandwidth in order to obtain the equivalent noise bandwidth of the measurement bandwidth.

#### 6.5F.2.2 Spectrum emission mask for operation with shared spectrum channel access

Editor’s Note:

- Message content is TBD

The spectrum emission mask of the UE applies to frequencies (ΔfOOB) starting from the ± edge of the assigned NR channel bandwidth. For frequencies offset greater than ΔfOOB, the spurious requirements in subclause 6.5.3 are applicable.

NOTE: For measurement conditions at the edge of each frequency range, the lowest frequency of the measurement position in each frequency range should be set at the lowest boundary of the frequency range plus MBW/2. The highest frequency of the measurement position in each frequency range should be set at the highest boundary of the frequency range minus MBW/2. MBW denotes the measurement bandwidth defined for the protected band.

6.5F.2.2.1 Test purpose

To verify that the power of any UE emission shall not exceed specified level for the specified channel bandwidth when UE is operating with shared spectrum channel access.

6.5F.2.2.2 Test applicability

This test case applies to all types of NR UE release 16 and forward that support NR standalone shared spectrum channel access.

6.5F.2.2.3 Minimum conformance requirements

Instead of the general spectrum emission mask requirement in clause 6.5.2.2, when operating with shared spectrum channel access the relative power of any UE emission shall not exceed the levels specified in Table 6.5F.2.2.3-1 for the specified channel bandwidth or -30 dBm/MHz whichever is the greatest. The spectrum emission mask for operation with shared spectrum channel access is defined relative to the maximum power density in a 1 MHz measurement bandwidth within the channel bandwidth.

The spectrum emission mask for operation with shared spectrum channel access applies to frequencies (ΔfOOB) starting from the ± edge of the assigned channel bandwidth. For frequencies offset greater than ΔfOOB, the spurious requirements in clause 6.5.3 are applicable.

Table 6.5F.2.2.3-1: Spectrum emission mask for operation with shared spectrum channel access

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Spectrum emission limit (dBr) / Channel bandwidth | | | | | | |
| ΔfOOB  (MHz) | 10 MHz | 20 MHz | 40 MHz | 60 MHz | 80 MHz | Measurement bandwidth (MBW) |
| ± 0-1 |  | | | | | [100kHz]3 |
| ± 1-5 | NOTE 1 | NOTE 1 | NOTE 1 | NOTE 1 | NOTE 1 | 1 MHz |
| ± 5-10 | NOTE 2 |  |  |  |  |  |
| ± 10-20 | -40 | NOTE 2 |  |  |  |  |
| ± 20-30 |  | -40 | NOTE 2 |  |  |  |
| ± 30-40 |  |  | NOTE 2 |  |  |
| ± 40-50 |  |  | -40 |  | NOTE 2 |  |
| ± 50-60 |  |  |  |  |  |  |
| ± 60-70 |  |  |  | -40 |  |  |
| ± 70-80 |  |  |  |  |  |  |
| ± 80-100 |  |  |  |  | -40 |  |
| NOTE 1: Given as: where  NOTE 2: Given as: where  NOTE 3: The measured value shall be scaled by a factor equal to the ratio of the reference bandwidth (1 MHz) to the measurement bandwidth before the emission limit (dBr) is applied.  NOTE 4: The carrier leakage exceptions from Table 6.4F.2.3.3-1 apply and carrier leakage contribution shall be removed prior to setting the 0dBr level of the mask, the reported carrier frequency location in *txDirectCurrentLocation* field of the *UplinkTxDirectCurrentBWP* can be used to cancel the carrier leakage contribution. If *txDirectCurrentLocation* is not available or is reported with value 3300 or 3301, a carrier frequency location at the centre of the channel shall be assumed. | | | | | | |

For measurement conditions at the edge of each frequency range, the lowest frequency of the measurement position in each frequency range should be set at the lowest boundary of the frequency range plus MBW/2. The highest frequency of the measurement position in each frequency range should be set at the highest boundary of the frequency range minus MBW/2.

6.5F.2.2.3.1 Spectrum emission mask for non-transmitted channels

In the case of non-transmitted 20 MHz channel(s) on the edges of an assigned channel bandwidth the spectrum emission mask for operation with shared spectrum channel access, specified in Table 6.5F.2.2.3-1, is applied by using the total bandwidth of the remaining transmitted channels. The spectrum emission mask for non-transmitted channels is floored at -28dBr.

The relative power of any UE emission shall not exceed the most stringent levels given by the spectrum emission mask for operation with shared spectrum channel access with full channel bandwidth and the spectrum emission mask for non-transmitted channels with the channel bandwidth of the transmitted channels in the case of non-transmitted channels at the edge of an assigned channel bandwidth.

An exception to the spectrum emission mask for non-transmitted channels allows a single [2] MHz bandwidth to extend to [-28] dBc relative to total transmit power, or [-20] dBm, whichever is the greatest.

The normative reference for this requirement is TS 38.101-1 [2] clause 6.5F.2.2.

6.5F.2.2.4 Test description

6.5F.2.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, test channel bandwidths and sub-carrier spacing based on NR operating bands with shared spectrum channel access specified in table 5.3.5-1. All of these configurations shall be tested with applicable test parameters for each combination of channel bandwidth and sub-carrier spacing, are shown in table 6.5F.2.2.4.1-1. The details of the uplink reference measurement channels (RMCs) are specified in Annexes A.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Table 6.5F.2.2.4.1-1: Test Configuration Table

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Initial Conditions | | | | |
| Test Environment as specified in TS 38.508-1 [5] subclause 4.1 | | | Normal | |
| Test Frequencies as specified in TS 38.508-1 [5] subclause 4.3.1 | | | Low range, High range | |
| Test Channel Bandwidths as specified in TS 38.508-1 [5] subclause 4.3.1 | | | 20 MHz, Highest | |
| Test SCS as specified in Table 5.3.5-1 | | | Lowest, Highest | |
| Test Parameters for Channel Bandwidths | | | | |
| Test ID | Freq | Downlink Configuration | Uplink Configuration | |
|  |  | N/A | Modulation (NOTE 2) | RB allocation (NOTE 1) |
| 12 | Default |  | DFT-s-OFDM Pi/2 BPSK | Full |
| 2 | Default |  | DFT-s-OFDM QPSK | Full |
| 3 | Default |  | DFT-s-OFDM 16 QAM | Full |
| 4 | Default |  | DFT-s-OFDM 64 QAM | Full |
| 5 | Default |  | DFT-s-OFDM 256 QAM | Full |
| 6 | Low |  | CP-OFDM QPSK | Partial\_Left |
| 7 | High |  | CP-OFDM QPSK | Partial\_Right |
| 8 | Default |  | CP-OFDM QPSK | Full |
| 9 | Low |  | CP-OFDM 16 QAM | Partial\_Left |
| 10 | High |  | CP-OFDM 16 QAM | Partial\_Right |
| 11 | Default |  | CP-OFDM 16 QAM | Full |
| 12 | Low |  | CP-OFDM 64 QAM | Partial\_Left |
| 13 | High |  | CP-OFDM 64 QAM | Partial\_Right |
| 14 | Default |  | CP-OFDM 64 QAM | Full |
| 15 | Low |  | CP-OFDM 256 QAM | Partial\_Left |
| 16 | High |  | CP-OFDM 256 QAM | Partial\_Right |
| 17 | Default |  | CP-OFDM 256 QAM | Full |
| 18 | Default |  | DFT-s-OFDM Pi/2 BPSK w Pi/2 BPSK DMRS3 | Full |
| NOTE 1: The specific configuration of each RB allocation is defined in Table 6.1F-1.  NOTE 2: DFT-s-OFDM Pi/2 BPSK test applies only for UEs which supports Pi/2 BPSK in FR1 and when IE powerBoostPi2BPSK is set to 0.  NOTE 3: Applicable to UEs indicating support for UE capability *lowPAPR-DMRS-PUSCHwithPrecoding-r16*. | | | | |

1. Connect the SS to the UE antenna connectors as shown in TS 38.508-1 [5] Annex A, Figure A.3.1.1.1 for TE diagram and section A.3.2 for UE diagram.

2. The parameter settings for the cell are set up according to TS 38.508-1 [5] subclause 4.4.3.

3. Downlink signals are initially set up according to Annex C.0, C.1, C.2 and uplink signals according to Annex G.0, G.1, G.2, G.3.0.

4. The UL Reference Measurement channels are set according to Table 6.5F.2.2.4.1-1.

5. Propagation conditions are set according to Annex B.0.

6. Ensure the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On,* Test Mode *On* and Test Loop Function *On* according to TS 38.508-1 [5] clause 4.5. Message contents are defined in clause 6.5F.2.2.4.3

6.5F.2.2.4.2 Test procedure

1. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0\_1 for C\_RNTI to schedule the UL RMC according to Table 6.5F.2.2.4.1-1. Since the UL has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC.

2. Send continuously power control “up” commands to the UE until the UE transmits at PUMAX level. Allow at least 200ms for the UE to reach PUMAX level.

3. Measure the mean power of the UE in the channel bandwidth of the radio access mode according to the test configuration, which shall meet the requirements described in Table 6.2F.2.5-1. The period of the measurement shall be at least the continuous duration of 1ms over consecutive active uplink slots.

4. Measure the power of the transmitted signal with a measurement filter of bandwidths according to table 6.5F.2.2.5-1 and using a rms detector. If the sweep count is higher than one, the trace mode shall be average. The centre frequency of the filter shall be stepped in continuous steps according to the same table. The measured power shall be recorded for each step. The measurement period shall capture the active TSs.

NOTE 1: When switching to DFT-s-OFDM waveform, as specified in the test configuration Table 6.5F.2.2.4.1-1, send an NR RRCReconfiguration message according to TS 38.508-1 [5] clause 4.6.3 Table 4.6.3-118 PUSCH-Config with TRANSFORM\_PRECODER\_ENABLED condition.

6.5F.2.2.4.3 Message contents

Message contents are according to TS 38.508-1 [5] subclause 4.6 with the following exceptions:

FFS

6.5F.2.2.5 Test requirement

The measured UE mean power in the channel bandwidth, derived in step 3, shall fulfil requirements in Table 6.2F.2.5-1, and the power of any UE emission shall fulfil requirements in Table 6.5F.2.2.5-1.

Table 6.5F.2.2.5-1: General NR spectrum emission mask

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Spectrum emission limit (dBr) / Channel bandwidth | | | | | | |
| ΔfOOB  (MHz) | 10 MHz | 20 MHz | 40 MHz | 60 MHz | 80 MHz | Measurement bandwidth (MBW) |
| ± 0-1 |  | | | | | [100kHz]3 |
| ± 1-5 | (NOTE 1) +TT | (NOTE 1) +TT | (NOTE 1) +TT | (NOTE 1) +TT | (NOTE 1) +TT | 1 MHz |
| ± 5-10 | (NOTE 2) +TT |  |  |  |  |  |
| ± 10-20 | -40 +TT | (NOTE 2) +TT |  |  |  |  |
| ± 20-30 |  | -40 +TT | (NOTE 2) +TT |  |  |  |
| ± 30-40 |  |  | (NOTE 2) +TT |  |  |
| ± 40-50 |  |  | -40 +TT |  | (NOTE 2) +TT |  |
| ± 50-60 |  |  |  |  |  |  |
| ± 60-70 |  |  |  | -40 +TT |  |  |
| ± 70-80 |  |  |  |  |  |  |
| ± 80-100 |  |  |  |  | -40 +TT |  |
| NOTE 1: Given as: where  NOTE 2: Given as: where  NOTE 3: The measured value shall be scaled by a factor equal to the ratio of the reference bandwidth (1 MHz) to the measurement bandwidth before the emission limit (dBr) is applied.  NOTE 4: The carrier leakage exceptions from Table 6.4F.2.3.3-1 apply and carrier leakage contribution shall be removed prior to setting the 0dBr level of the mask, the reported carrier frequency location in *txDirectCurrentLocation* field of the *UplinkTxDirectCurrentBWP* can be used to cancel the carrier leakage contribution. If *txDirectCurrentLocation* is not available or is reported with value 3300 or 3301, a carrier frequency location at the centre of the channel shall be assumed.  NOTE 5: TT for each frequency and channel bandwidth is specified in Table 6.5F.2.2.5-2. | | | | | | |

Table 6.5F.2.2.5-2: Test Tolerance (Spectrum Emission Mask)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | f ≤ 3.0GHz | 3.0GHz < f ≤ 4.2GHz | 4.2GHz < f ≤ 6.0GHz | 6.0GHz < f ≤ 7.125GHz |
| BW ≤ 100MHz | 1.5 dB | 1.8 dB | 1.8 dB | 1.8 dB |

NOTE: As a general rule, the resolution bandwidth of the measuring equipment should be equal to the measurement bandwidth. However, to improve measurement accuracy, sensitivity and efficiency, the resolution bandwidth may be smaller than the measurement bandwidth. When the resolution bandwidth is smaller than the measurement bandwidth, the result should be integrated over the measurement bandwidth in order to obtain the equivalent noise bandwidth of the measurement bandwidth.

#### 6.5F.2.4 Adjacent channel leakage ratio for operation with shared spectrum channel access

Adjacent Channel Leakage power Ratio (ACLR) is the ratio of the filtered mean power centred on the assigned channel frequency to the filtered mean power centred on an adjacent channel frequency.

To improve measurement accuracy, sensitivity and efficiency, the resolution bandwidth may be smaller than the measurement bandwidth. When the resolution bandwidth is smaller than the measurement bandwidth, the result should be integrated over the measurement bandwidth in order to obtain the equivalent noise bandwidth of the measurement bandwidth.

##### 6.5F.2.4.1 Shared spectrum channel access ACLR

Editor’s Note: The following aspects are not yet determined:

- MU and TT for >6GHz (band n96) are TBD are working assumption based on analysis of single TE vendor. Values will be revisited once analysis from other TE vendors is available.

- RMC in Annex A.

- Test coverage for UL-MIMO

- Message exceptions

- Test state and generic procedure are TBD in 38.508-1

6.5F.2.4.1.1 Test purpose

To verify that UE transmitter does not cause unacceptable interference to adjacent channels in terms of Adjacent Channel Leakage power Ratio (ACLR).

6.5F.2.4.1.2 Test applicability

This test case applies to all types of NR UE release 16 and forward that support NR standalone operation with shared spectrum channel access.

6.5F.2.4.1.3 Minimum conformance requirements

The Adjacent Channel Leakage power Ratio is the ratio of the filtered mean power centred on the assigned channel frequency to the filtered mean power centred on an adjacent channel frequency at nominal channel spacing. The assigned channel power and adjacent channel power are measured with rectangular filters with measurement bandwidths specified in Table 6.5.2.4.1.3-1.

Instead of the general ACLR requirement in clause 6.5.2.4, if the measured adjacent channel power is greater than –47 dBm then the ACLR shall be higher than the value specified in Table 6.5F.2.4.1.3-1.

Table 6.5F.2.4.1.3-1: Shared spectrum channel access ACLR requirement

|  |  |
| --- | --- |
|  | Power class 5 |
| ACLR | 27 dB |

The normative reference for this requirement is TS 38.101-1 [2] clause 6.5F.2.4.1.

6.5F.2.4.1.4 Test description

6.5F.2.4.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, test channel bandwidths and sub-carrier spacing based on NR operating bands specified in Table 5.3.5-1. All of these configurations shall be tested with applicable test parameters for each combination of channel bandwidth and sub-carrier spacing, are shown in the test configuration tables in Table 6.2F.2.4.1-1. The details of the uplink reference measurement channels (RMCs) are specified in Annexes A.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2

Table 6.5F.2.4.1.4.1-1: Void

1. Connect the SS to the UE antenna connectors as shown in TS 38.508-1 [5] Annex A, Figure A.3.1.1.1 for TE diagram and section A.3.2 for UE diagram.

2. The parameter settings for the cell are set up according to TS 38.508-1 [5] subclause 4.4.3.

3. Downlink signals are initially set up according to Annex C.0, C.1, C.2, and uplink signals according to Annex G.0, G.1, G.2, G.3.0.

4. The UL Reference Measurement channels are set according to the test configuration tables in clause 6.2F.2.4.1[TBD].

5. Propagation conditions are set according to Annex B.0.

6. Ensure the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On,* Test Mode *On* and Test Loop Function *On* according to TS 38.508-1 [5] clause 4.5. Message contents are defined in clause 6.5F.2.4.1.4.3.

6.5F.2.4.1.4.2 Test procedure

1. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0\_1 for C\_RNTI to schedule the UL RMC according to the test configuration tables in clause Table 6.2F.2.4.1. Since the UL has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC.

2. Send continuously power control “up” commands to the UE until the UE transmits at PUMAX level. Allow at least 200ms for the UE to reach PUMAX level.

3. Measure the mean power of the UE in the channel bandwidth of the radio access mode according to the test configuration, as measured in step 3 of 6.2F.2.4.2, which shall meet the requirements in clause 6.2F.2.5 as appropriate.

4. Measure the rectangular filtered mean power for the assigned NR channel using a rms detector. If the sweep count is higher than one, the trace mode shall be average.

5. Measure the rectangular filtered mean power of the first NR adjacent channel on both lower and upper side of the assigned NR channel using a rms detector, respectively. If the sweep count is higher than one, the trace mode shall be average.

6. Calculate the ratios of the power between the values measured in step 4 over step 5 for lower and upper NR ACLR, respectively.

NOTE 1: When switching to DFT-s-OFDM waveform, as specified in the test configuration tables in clause 6.2F.2.4.1[TBD], send an NR RRCReconfiguration message according to TS 38.508-1 [5] clause 4.6.3 Table 4.6.3-118 PUSCH-Config with TRANSFORM\_PRECODER\_ENABLED condition.

6.5F.2.4.1.4.3 Message contents

Message contents are according to TS 38.508-1 [5] subclause 4.6 and 5.4 with the following exceptions:

FFS

6.5F.2.4.1.5 Test requirement

The measured UE mean power in the channel bandwidth, derived in step 3, shall fulfil requirements in clause 6.2F.2.5, and if the measured adjacent channel power is greater than –47 dBm then the measured NR ACLR, derived in step 6, shall be higher than the limits in Table 6.5F.2.4.1.5-2.

Table 6.5F.2.4.1.5-1: NR ACLR measurement bandwidth

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | 10 MHz | 20 MHz | 40 MHz | 60 MHz | 80 MHz |
| NR ACLR measurement bandwidth (MHz) | 9.375 | 19.095 | 38.895 | 58.35 | 78.15 |

Table 6.5F.2.4.1.5-2: NR ACLR requirement

|  |  |
| --- | --- |
|  | Power class 5 |
| NR ACLR | 27 - TT dB |
| NOTE 1: TT for each frequency and channel bandwidth is specified in Table 6.5F.2.4.1.5-3. | |

Table 6.5F.2.4.1.5-3: Test Tolerance (TT) (NR ACLR)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | f ≤ 3.0GHz | 3.0GHz < f ≤ 4.2GHz | 4.2GHz < f ≤ 5.925GHz | 5.925GHz < f ≤ 7.125GHz |
| BW ≤ 100MHz | 0.8 dB | 0.8 dB | 0.8 dB | 0.8 dB |

##### 6.5F.2.4.2 Shared spectrum channel access ACLR with additional requirement for NS\_29

Editor’s Note: The following aspects are not yet determined:

- MU and TT for >6GHz (band n96) are TBD.

- RMC in Annex A.

- Test coverage for UL-MIMO

- Message exceptions

- Test state and generic procedure are TBD in 38.508-1

6.5F.2.4.2.1 Test purpose

To verify that UE transmitter does not cause unacceptable interference to adjacent channels in terms of Adjacent Channel Leakage power Ratio (ACLR).

6.5F.2.4.2.2 Test applicability

This test case applies for network signalling value NS\_29 to all types of NR UE release 16 and forward that support NR standalone operation with shared spectrum channel access.

6.5F.2.4.2.3 Minimum conformance requirements

When "NS\_29" is indicated in the cell, the UE emission shall meet the additional requirements specified in Table 6.5F.2.4.2.3-1 for shared spectrum channels assigned within 5150 – 5350 MHz and 5470 – 5730 MHz.

Table 6.5F.2.4.2.3-1: ACLR2 requirement for "NS\_29"

|  |  |  |  |
| --- | --- | --- | --- |
| **Power class 5** | 20 MHz | 40 MHz | 60, 80 MHz |
| ACLR2 | 40 dB | 40 dB | N/A |
| Measurement bandwidth | 20 MHz | 40 MHz | N/A |
| Adjacent channel centre frequency offset (MHz) | +40 / -40 | +80 / -80 | N/A |

The normative reference for this requirement is TS 38.101-1 [2] clause 6.5F.2.4.2.

6.5F.2.4.2.4 Test description

6.5F.2.4.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, test channel bandwidths and sub-carrier spacing based on NR operating bands specified in Table 5.3.5-1. All of these configurations shall be tested with applicable test parameters for each combination of channel bandwidth and sub-carrier spacing, are shown in the test configuration tables in clause 6.5F.2.4.1.4.1. The details of the uplink reference measurement channels (RMCs) are specified in Annexes A.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2

1. Connect the SS to the UE antenna connectors as shown in TS 38.508-1 [5] Annex A, Figure A.3.1.1.1 for TE diagram and section A.3.2 for UE diagram.

2. The parameter settings for the cell are set up according to TS 38.508-1 [5] subclause 4.4.3.

3. Downlink signals are initially set up according to Annex C.0, C.1, C.2, and uplink signals according to Annex G.0, G.1, G.2, G.3.0.

4. The UL Reference Measurement channels are set according to the test configuration tables in clause 6.5F.2.4.1.4.1.

5. Propagation conditions are set according to Annex B.0.

6. Ensure the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On,* Test Mode *On* and Test Loop Function *On* according to TS 38.508-1 [5] clause 4.5. Message contents are defined in clause 6.5F.2.4.2.4.3.

6.5F.2.4.2.4.2 Test procedure

1. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0\_1 for C\_RNTI to schedule the UL RMC according to the test configuration tables in clause 6.2F.2.4.1. Since the UL has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC.

2. Send continuously power control “up” commands to the UE until the UE transmits at PUMAX level. Allow at least 200ms for the UE to reach PUMAX level.

3. Measure the mean power of the UE in the channel bandwidth of the radio access mode according to the test configuration, as measured in step 3 of 6.2F.2.4.2, which shall meet the requirements in clause 6.2F.2.5 as appropriate.

4. Measure the rectangular filtered mean power for the assigned NR channel.

5. Measure the rectangular filtered mean power of the first NR adjacent channel on both lower and upper side of the assigned NR channel, respectively.

6. Calculate the ratios of the power between the values measured in step 4 over step 5 for lower and upper NR ACLR, respectively.

NOTE 1: When switching to DFT-s-OFDM waveform, as specified in the test configuration tables in clause 6.2F.2.4.1[TBD], send an NR RRCReconfiguration message according to TS 38.508-1 [5] clause 4.6.3 Table 4.6.3-118 PUSCH-Config with TRANSFORM\_PRECODER\_ENABLED condition.

6.5F.2.4.2.4.3 Message contents

Message contents are according to TS 38.508-1 [5] subclause 4.6 and 5.4 with the following exceptions:

Table 6.5F.2.4.2.4.3-1: *AdditionalSpectrumEmission*: Additional spurious emissions test requirement for "NS\_29"

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [5] clause 4.6.3, Table 4.6.3-1 *AdditionalSpectrumEmission* | | | |
| Information Element | Value/remark | Comment | Condition |
| AdditionalSpectrumEmission | 2 (NS\_29) | for band n46 |  |

6.5F.2.4.2.5 Test requirement

The measured UE mean power in the channel bandwidth, derived in step 3, shall fulfil requirements in clause 6.2F.2.5[TBD], and if the measured adjacent channel power is greater than –50 dBm then the measured NR ACLR, derived in step 6, shall be higher than the limits in Table 6.5F.2.4.2.5-2.

Table 6.5F.2.4.2.5-1: NR ACLR2 measurement bandwidth and offset

|  |  |  |  |
| --- | --- | --- | --- |
|  | 20 MHz | 40 MHz | 60, 80 MHz |
| NR ACLR2 measurement bandwidth  (MHz) | 20 MHz | 40 MHz | N/A |
| Adjacent channel centre frequency offset (MHz) | +40 / -40 | +80 / -80 | N/A |

Table 6.5F.2.4.2.5-2: NR ACLR2 requirement

|  |  |
| --- | --- |
|  | Power class 5 |
| NR ACLR2 | 40 - TT dB |
| NOTE 1: TT for each frequency and channel bandwidth is specified in Table 6.5F.2.4.2.5-3. | |

Table 6.5F.2.4.2.5-3: Test Tolerance (TT) (NR ACLR2)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | f ≤ 3.0GHz | 3.0GHz < f ≤ 4.2GHz | 4.2GHz < f ≤ 5.925GHz | 5.925GHz < f ≤ 7.125GHz |
| BW ≤ 100MHz | 0.8 dB | 0.8 dB | 0.8 dB | 0.8 dB |

### 6.5F.3 Spurious emissions for shared spectrum channel access

Spurious emissions are emissions which are caused by unwanted transmitter effects such as harmonics emission, parasitic emissions, intermodulation products and frequency conversion products, but exclude out of band emissions unless otherwise stated. The spurious emission limits are specified in terms of general requirements in line with SM.329 [9] and NR operating band requirement to address UE co-existence.

To improve measurement accuracy, sensitivity and efficiency, the resolution bandwidth may be smaller than the measurement bandwidth. When the resolution bandwidth is smaller than the measurement bandwidth, the result should be integrated over the measurement bandwidth in order to obtain the equivalent noise bandwidth of the measurement bandwidth.

NOTE: For measurement conditions at the edge of each frequency range, the lowest frequency of the measurement position in each frequency range should be set at the lowest boundary of the frequency range plus MBW/2. The highest frequency of the measurement position in each frequency range should be set at the highest boundary of the frequency range minus MBW/2. MBW denotes the measurement bandwidth defined for the protected band.

#### 6.5F.3.1 General spurious emissions

Editor’s Note: This clause is incomplete. The following aspects are either missing or not yet determined

- Test state and generic procedure are TBD in 38.508-1

6.5F.3.1.1 Test purpose

To verify that UE transmitter does not cause unacceptable interference to other channels or other systems in terms of transmitter spurious emissions.

6.5F.3.1.2 Test applicability

This test case applies to all types of NR UE release 16 and forward that support NR standalone shared spectrum channel access.

6.5F.3.1.3 Minimum conformance requirements

The requirements for general spurious emission requirements in clause 6.5.3.1 apply.

The normative reference for this requirement is TS 38.101-1 [2] subclause 6.5F.3.1.

6.5F.3.1.4 Test description

6.5F.3.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, test channel bandwidths and sub-carrier spacing based on NR operating bands specified in Table 5.3.5-1. All of these configurations shall be tested with applicable test parameters for each combination of channel bandwidth and sub-carrier spacing, are shown in table 6.5F.3.1.4.1-1. The details of the uplink reference measurement channels (RMCs) are specified in Annexes A.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Table 6.5F.3.1.4.1-1: Test Configuration Table

|  |  |  |  |
| --- | --- | --- | --- |
| Initial Conditions | | | |
| Test Environment as specified in TS 38.508-1 [5] subclause 4.1. | | Normal | |
| Test Frequencies as specified in TS 38.508-1 [5] subclause 4.3.1. | | Low range, Mid range, High range (NOTE 2) | |
| Test Channel Bandwidths as specified in TS 38.508-1 [5] subclause 4.3.1. | | Lowest, Mid, Highest | |
| Test SCS as specified in Table 5.3.5-1 | | Lowest | |
| Test Parameters | | | |
| Test ID | Downlink Configuration | Uplink Configuration | |
|  | N/A for Spurious Emissions testing | Modulation | RB allocation (NOTE 1) |
| 1 | CP-OFDM QPSK | OuterFull |
| 2 | CP-OFDM QPSK | Edge\_1RB\_Left |
| 3 | CP-OFDM QPSK | Edge\_1RB\_Right |
| NOTE 1: The specific configuration of each RB allocation is defined in Table 6.1-1 Common UL configuration. | | | |

1. Connect the SS to the UE antenna connectors as shown in TS 38.508-1 [5] Annex A, Figure A.3.1.1.1 for TE diagram and section A.3.2 for UE diagram.

2. The parameter settings for the cell are set up according to TS 38.508-1 [5] subclause 4.4.3.

3. Downlink signals are initially set up according to Annex C.0, C.1 and C.2, and uplink signals according to Annex G.0, G.1, G.2, G.3.0.

4. The UL Reference Measurement channels are set according to Table 6.5F.3.1.4.1-1.

5. Propagation conditions are set according to Annex B.0.

6. Ensure the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On,* Test Mode *On* and Test Loop Function *On* according to TS 38.508-1 [5] clause 4.5. Message contents are defined in clause 6.5F.3.1.4.3.

6.5F.3.1.4.2 Test procedure

1. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0\_1 for C\_RNTI to schedule the UL RMC according to Table 6.5F.3.1.4.1-1. Since the UE has no payload data to send, the UE transmits uplink MAC padding bits on the UL RMC.

2. Send continuously uplink power control "up" commands in the uplink scheduling information to the UE until the UE transmits at PUMAX level.

3. Measure the power of the transmitted signal with a measurement filter of bandwidths according to table 6.5F.3.1.5-1. The centre frequency of the filter shall be stepped in contiguous steps according to table 6.5F.3.1.5-1. The measured power shall be verified for each step. The measurement period shall capture the active time slots. During measurement the spectrum analyser shall be set to 'Detector' = RMS. If the sweep count is higher than one, the trace mode shall be average.

6.5F.3.1.4.3 Message contents

Message contents are according to TS 38.508-1 [5] subclause 4.6.

6.5F.3.1.5 Test requirement

This clause specifies the requirements for the specified NR standalone shared spectrum channel access for Transmitter Spurious emissions requirement with frequency range as indicated in table 6.5F.3.1.5-1.

Unless otherwise stated, the spurious emission limits apply for the frequency ranges that are more than FOOB (MHz) in Table 6.5.3.1.3-1 from the edge of the channel bandwidth. The spurious emission limits in Table 6.5F.3.1.5-1 apply for all transmitter band configurations (NRB) and channel bandwidths for shared spectrum channel access.

The measured average power of spurious emission, derived in step 3, shall not exceed the described value in Table 6.5F.3.1.5-1.

Table 6.5F.3.1.5-1: General spurious emissions test requirements

|  |  |  |  |
| --- | --- | --- | --- |
| Frequency Range | Maximum Level | Measurement bandwidth | NOTE |
| 9 kHz ≤ f < 150 kHz | -36 dBm | 1 kHz |  |
| 150 kHz ≤ f < 30 MHz | -36 dBm | 10 kHz |  |
| 30 MHz ≤ f < 1000 MHz | -36 dBm | 100 kHz |  |
| 1 GHz ≤ f < 12.75 GHz | -30 dBm | 1 MHz |  |
| -25 dBm | 1 MHz |  |
| 12.75 GHz ≤ f < 5th harmonic of the upper frequency edge of the UL operating band in GHz | -30 dBm | 1 MHz | 1 |
| 12.75 GHz < f < 26 GHz | -30 dBm | 1 MHz | 2 |
| NOTE 1: Applies for Band that the upper frequency edge of the UL Band more than 2.69 GHz  NOTE 2: Applies for Band that the upper frequency edge of the UL Band more than 5.2 GHz | | | |

#### 6.5F.3.2 Spurious emissions for UE co-existence

Spurious emissions requirements for UE coexistence are not applicable to bands restricted to stand-alone operation with shared spectrum channel access as identified in Table 5.2-1.

#### 6.5F.3.3 Additional spurious emissions for shared spectrum channel access

Editor’s note: This clause is incomplete. The following aspects are either missing or not yet determined:

- Test points are TBD except for NS\_28 and NS\_29

- MU and TT for >6GHz (band n96) are working assumption based on analysis of single TE vendor. Values will be revisited once analysis from other TE vendors is available.

- RMC in Annex A.

- Test coverage for UL-MIMO

- Message exceptions

- Test state and generic procedure are TBD in 38.508-1

6.5F.3.3.1 Test purpose

To verify that UE transmitter does not cause unacceptable interference to other channels or other systems in terms of transmitter spurious emissions under the deployment scenarios where additional requirements are specified.

6.5F.3.3.2 Test applicability

This test case applies to all types of NR UE release 16 and forward that support NR standalone shared spectrum channel access.

6.5F.3.3.3 Minimum conformance requirements

These requirements are specified in terms of an additional spectrum emission requirement. Additional spurious emission requirements are signalled by the network to indicate that the UE shall meet an additional requirement for a specific deployment scenario as part of the cell handover/broadcast message.

6.5F.3.3.3.1 Minimum conformance requirements (network signalling value "NS\_28")

When "NS\_28" is indicated in the cell, the power of any UE emission for channels assigned within 5150-5350 and 5470-5725 MHz shall not exceed the levels specified in Table 6.5F.3.3.1-1. This requirement also applies for the frequency ranges that are less than FOOB (MHz) in Table 6.6.3.1-1 from the edge of the channel bandwidth.

Table 6.5F.3.3.3.1-1: Additional requirements

|  |  |  |
| --- | --- | --- |
| Frequency band  (MHz) | Channel bandwidth /  Spectrum emission limit  (dBm) | Measurement bandwidth |
|  | 20, 40, 60, 80, [100] MHz |  |
| 47 ≤ f ≤ 74 | -54 | 100 kHz |
| 87.5 ≤ f ≤ 118 | -54 | 100 kHz |
| 174 ≤ f ≤ 230 | -54 | 100 kHz |
| 470 ≤ f ≤ 862 | -54 | 100 kHz |
| 1000 ≤ f ≤ 5150 | -30 | 1 MHz |
| 5350 ≤ f ≤ 5470 | -30 | 1 MHz |
| 5725 ≤ f ≤ 26000 | -30 | 1 MHz |

The normative reference for this requirement is TS 38.101-1 [2] subclause 6.5F.3.3.1.

6.5F.3.3.3.2 Minimum conformance requirements (network signalling value "NS\_29")

When "NS\_29" is indicated in the cell, the power of any UE emission for channels assigned within 5150-5350 and 5470-5730 MHz shall not exceed the levels specified in Table 6.5F.3.3.2-1, Table 6.5F.3.3.2-2, and Table 6.F.3.3.2-3. This requirement also applies for the frequency ranges that are less than FOOB (MHz) in Table 6.6.3.1-1 from the edge of the channel bandwidth.

Table 6.5F.3.3.3.2-1: Additional requirements for 20 MHz channel bandwidth

|  |  |  |  |
| --- | --- | --- | --- |
| Center  Frequency Fc  [MHz] | Protected range  [MHz] | Minimum requirement  [dBm] | Measurement bandwidth |
| 5179.98 ≤ Fc ≤ 5239.98 | 5135 ≤ f ≤ 5142 | -26 | 1 MHz |
|  | 5142 < f ≤ 5150 | -18 |  |
|  | 5250 ≤ f < 5250.2 | 3 to -2 |  |
|  | 5250.2 ≤ f < 5251 | -2 to -10 |  |
|  | 5251 ≤ f < 5260 | -10 to -18 |  |
|  | 5260 ≤ f < 5266.7 | -18 to -26 |  |
|  | 5266.7 ≤ f ≤ 5365 | -26 |  |
| 5260.02 ≤ Fc ≤ 5320.02 | 5135 ≤ f ≤ 5233.3 | -26 |  |
|  | 5233.3 < f ≤ 5240 | -26 to -18 |  |
|  | 5240 < f ≤ 5249 | -18 to -10 |  |
|  | 5249 < f ≤ 5249.8 | -10 to -2 |  |
|  | 5249.8 < f ≤ 5250 | -2 to 3 |  |
|  | 5350 ≤ f ≤ 5365 | -26 |  |
| 5500.02 ≤ Fc ≤ 5719.98 | 5420 ≤ f ≤ 5460 | -26 |  |
|  | 5460 < f ≤ 5470 | -19 |  |
|  | 5745 ≤ f < 5765 | -19 |  |
|  | 5765 ≤ f ≤ 5800 | -26 |  |
| NOTE: The minimum requirement when specified as a range denotes the emission requirement at the end points of the protected range. The requirement within the protected range is obtained by linear interpolation between the requirements at the end points. | | | |

Table 6.5F.3.3.3.2-2: Additional requirements for 40 MHz channel bandwidth

|  |  |  |  |
| --- | --- | --- | --- |
| Center  Frequency Fc  [MHz] | Protected range  [MHz] | Minimum requirement  [dBm] | Measurement bandwidth |
| 5190 ≤ Fc ≤ 5230.02 | 5100 ≤ f ≤ 5141.6 | -26 | 1 MHz |
|  | 5141.6 < f ≤ 5150 | -18 |  |
|  | 5250 ≤ f < 5251 | -3 to -13 |  |
|  | 5251 ≤ f < 5270 | -13 to -21 |  |
|  | 5270 ≤ f < 5278.4 | -21 to -26 |  |
|  | 5278.4 ≤ f ≤ 5400 | -26 |  |
| 5269.98 ≤ Fc ≤ 5310 | 5210 < f ≤ 5221.6 | -26 |  |
|  | 5221.6 < f ≤ 5230 | -26 to -21 |  |
|  | 5230 < f ≤ 5249 | -21 to -13 |  |
|  | 5249 ≤ f ≤ 5250 | -13 to -3 |  |
|  | 5350 ≤ f ≤ 5358.4 | -18 |  |
|  | 5358.4 < f ≤ 5400 | -26 |  |
| 5509.98 ≤ Fc ≤ 5670 | 5420 ≤ f ≤ 5460 | -19 |  |
|  | 5460 < f ≤ 5470 | -13 |  |
|  | 5770 ≤ f ≤ 5800 | -19 |  |
| NOTE: The minimum requirement when specified as a range denotes the emission requirement at the end points of the protected range. The requirement within the protected range is obtained by linear interpolation between the requirements at the end points. | | | |

Table 6.5F.3.3.3.2-3: Additional requirements for 60 and 80 MHz channel bandwidth

|  |  |  |  |
| --- | --- | --- | --- |
| Center  Frequency Fc  [MHz] | Protected range  [MHz] | Minimum requirement  [dBm] | Measurement bandwidth |
| 5200.02 ≤ Fc ≤ 5220 | 5020 ≤ f ≤ 5123.2 | -26 | 1 MHz |
|  | 5123.2 < f ≤ 5150 | -18 |  |
|  | 5250 ≤ f < 5251 | -6 to -16 |  |
|  | 5251 ≤ f < 5290 | -16 to -24 |  |
|  | 5290 ≤ f < 5296.7 | -24 to -26 |  |
|  | 5296.7 ≤ f ≤ 5480 | -26 |  |
| 5280 ≤ Fc ≤ 5299.98 | 5020 ≤ f ≤ 5203.3 | -26 |  |
|  | 5203.3 < f ≤ 5210 | -26 to -24 |  |
|  | 5210 < f ≤ 5249 | -24 to -16 |  |
|  | 5249 < f ≤ 5250 | -16 to -6 |  |
|  | 5350 ≤ f < 5376.8 | -18 |  |
|  | 5376.8 ≤ f ≤ 5480 | -26 |  |
| 5520 ≤ Fc ≤ 5689.98 | 5340 ≤ f ≤ 5460 | -19 |  |
|  | 5460 < f ≤ 5469.5 | -13 |  |
|  | 5469.5 < f ≤ 5470 | -13 |  |
|  | 5770 ≤ f ≤ 5800 | -19 |  |
| NOTE: The minimum requirement when specified as a range denotes the emission requirement at the end points of the protected range. The requirement within the protected range is obtained by linear interpolation between the requirements at the end points. | | | |

The normative reference for this requirement is TS 38.101-1 [2] subclause 6.5F.3.3.2.

6.5F.3.3.4 Test description

6.5F.3.3.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, test channel bandwidths and sub-carrier spacing based on NR operating bands specified in Table 5.3.5-1. All these configurations shall be tested with applicable test parameters for each combination of channel bandwidth and sub-carrier spacing, and are shown in Table 6.5F.3.3.4.1-1 through Table 6.5F.3.3.4.1-2. The details of the uplink reference measurement channels (RMCs) are specified in Annex A.2.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Table 6.5F.3.3.4.1-1: Test Configuration Table (network signalling value "NS\_28")

Same test configuration as listed in Table 6.2F.3.4.1-1 shall be used.

Table 6.5F.3.3.4.1-2: Test Configuration Table (network signalling value "NS\_29")

Same test configuration as listed in Table 6.2F.3.4.1-1 shall be used.

1. Connect the SS to the UE to the UE antenna connectors as shown in TS 38.508-1 [5] Annex A Figure A.3.1.2.2 for TE diagram and section A.3.2 for UE diagram.

2. The parameter settings for the cell are set up according to TS 38.508-1 [5] subclause 4.4.3.

3. Downlink signals are initially set up according to Annex C.0, C.1, C.2, and uplink signals according to Annex G.0, G.1, G.2, G.3.0.

4. The UL Reference Measurement channels are set according to Table 6.5F.3.3.4.1-1 through Table 6.5F.3.3.4.1-2.

5. Propagation conditions are set according to Annex B.0.

6. Ensure the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On,* Test Mode *On* and Test Loop Function *On* according to TS 38.508-1 [5] clause 4.5. Message contents are defined in clause 6.5F.3.3.4.3.

6.5F.3.3.4.2 Test procedure

1 SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0\_1 for C\_RNTI to schedule the UL RMC according to Table 6.5F.3.3.4.1-1 1 through Table 6.5F.3.3.4.1-2. Since the UE has no payload data to send, the UE transmits uplink MAC padding bits on the UL RMC..

2. Send continuously uplink power control "up" commands in the uplink scheduling information to the UE until the UE transmits at PUMAX level.

3. Measure the mean power of the UE in the channel bandwidth of the radio access mode according to the test configuration in Tables 6.5F.3.3.4.1-1 through 6.5F.3.3.4.1-2 as appropriate, which shall meet the requirements in clause 6.5F.3.3.5 with allowed A-MPR values specified in 6.2F.3.5. The measured power shall be verified for each step. The measurement period shall capture the active time slots.

4. Measure the power of the transmitted signal at each UE antenna connector with a measurement filter of bandwidths to clauses 6.5F.3.3.3.1 to 6.5F.3.3.3.2 as appropriate. The centre frequency of the filter shall be stepped in contiguous steps according to the same table the measured power shall be verified for each step. The measurement period shall capture the active time slots. During measurement the spectrum analyser shall be set to 'Detector' = RMS.

6.5F.3.3.4.3 Message contents

Message contents are according to TS 38.508-1 [5] subclause 4.6 and same exceptions listed in 6.2F.3.4.3

6.5F.3.3.5 Test requirement

The measured power at each UE antenna connector derived in step 4 shall meet the requirements for the specified NR band for an additional spurious emission requirement with protected bands as indicated from Table 6.5F.3.3.5.1 to Table 6.5F.3.3.5.2 for different NS values.

NOTE: For measurement conditions at the edge of each frequency range, the lowest frequency of the measurement position in each frequency range should be set at the lowest boundary of the frequency range plus MBW/2. The highest frequency of the measurement position in each frequency range should be set at the highest boundary of the frequency range minus MBW/2. MBW denotes the measurement bandwidth defined for the protected band.

6.5F.3.3.5.1 Test requirement (network signalling value “NS\_28”)

When “NS\_28” is indicated in the cell,

The measured UE mean power in the channel bandwidth, derived in step 3, shall fulfil requirements in Table 6.2F.3.5-1 for power class 5 UE.

The power of any UE emission for channels assigned within 5150-5350 and 5470-5725 MHz shall not exceed the levels specified in Table 6.5F.3.3.5.1-1. This requirement also applies for the frequency ranges that are less than FOOB (MHz) in Table 6.5.3.1.3-1 from the edge of the channel bandwidth

Table 6.5F.3.3.5.1-1: Additional requirements

|  |  |  |
| --- | --- | --- |
| Frequency band  (MHz) | Channel bandwidth /  Spectrum emission limit  (dBm) | Measurement bandwidth |
|  | 20, 40, 60, 80, [100] MHz |  |
| 47 ≤ f ≤ 74 | -54 | 100 kHz |
| 87.5 ≤ f ≤ 118 | -54 | 100 kHz |
| 174 ≤ f ≤ 230 | -54 | 100 kHz |
| 470 ≤ f ≤ 862 | -54 | 100 kHz |
| 1000 ≤ f ≤ 5150 | -30 | 1 MHz |
| 5350 ≤ f ≤ 5470 | -30 | 1 MHz |
| 5725 ≤ f ≤ 26000 | -30 | 1 MHz |

6.5F.3.3.5.2 Test requirement (network signalling value “NS\_29”)

When “NS\_29” is indicated in the cell,

The measured UE mean power in the channel bandwidth, derived in step 3, shall fulfil requirements in Table 6.2F.3.5-2 for power class 5 UE.

The power of any UE emission for channels assigned within 5150-5350 and 5470-5730 MHz shall not exceed the levels specified in Table 6.5F.3.3.5.2-1 and Table 6.5F.3.3.5.2-2. This requirement also applies for the frequency ranges that are less than FOOB (MHz) in Table 6.5.3.1.3-1 from the edge of the channel bandwidth

Table 6.5F.3.3.5.2-1: Additional requirements for 40 MHz channel bandwidth

|  |  |  |  |
| --- | --- | --- | --- |
| Center  Frequency Fc  [MHz] | Protected range  [MHz] | Minimum requirement  [dBm] | Measurement bandwidth |
| 5190 ≤ Fc ≤ 5230.02 | 5100 ≤ f ≤ 5141.6 | -26 | 1 MHz |
|  | 5141.6 < f ≤ 5150 | -18 |  |
|  | 5250 ≤ f < 5251 | -3 to -13 |  |
|  | 5251 ≤ f < 5270 | -13 to -21 |  |
|  | 5270 ≤ f < 5278.4 | -21 to -26 |  |
|  | 5278.4 ≤ f ≤ 5400 | -26 |  |
| 5269.98 ≤ Fc ≤ 5310 | 5210 < f ≤ 5221.6 | -26 |  |
|  | 5221.6 < f ≤ 5230 | -26 to -21 |  |
|  | 5230 < f ≤ 5249 | -21 to -13 |  |
|  | 5249 ≤ f ≤ 5250 | -13 to -3 |  |
|  | 5350 ≤ f ≤ 5358.4 | -18 |  |
|  | 5358.4 < f ≤ 5400 | -26 |  |
| 5509.98 ≤ Fc ≤ 5670 | 5420 ≤ f ≤ 5460 | -19 |  |
|  | 5460 < f ≤ 5470 | -13 |  |
|  | 5770 ≤ f ≤ 5800 | -19 |  |
| NOTE: The minimum requirement when specified as a range denotes the emission requirement at the end points of the protected range. The requirement within the protected range is obtained by linear interpolation between the requirements at the end points. | | | |

Table 6.5F.3.3.5.2-2: Additional requirements for 60 and 80 MHz channel bandwidth

|  |  |  |  |
| --- | --- | --- | --- |
| Center  Frequency Fc  [MHz] | Protected range  [MHz] | Minimum requirement  [dBm] | Measurement bandwidth |
| 5200.02 ≤ Fc ≤ 5220 | 5020 ≤ f ≤ 5123.2 | -26 | 1 MHz |
|  | 5123.2 < f ≤ 5150 | -18 |  |
|  | 5250 ≤ f < 5251 | -6 to -16 |  |
|  | 5251 ≤ f < 5290 | -16 to -24 |  |
|  | 5290 ≤ f < 5296.7 | -24 to -26 |  |
|  | 5296.7 ≤ f ≤ 5480 | -26 |  |
| 5280 ≤ Fc ≤ 5299.98 | 5020 ≤ f ≤ 5203.3 | -26 |  |
|  | 5203.3 < f ≤ 5210 | -26 to -24 |  |
|  | 5210 < f ≤ 5249 | -24 to -16 |  |
|  | 5249 < f ≤ 5250 | -16 to -6 |  |
|  | 5350 ≤ f < 5376.8 | -18 |  |
|  | 5376.8 ≤ f ≤ 5480 | -26 |  |
| 5520 ≤ Fc ≤ 5689.98 | 5340 ≤ f ≤ 5460 | -19 |  |
|  | 5460 < f ≤ 5469.5 | -13 |  |
|  | 5469.5 < f ≤ 5470 | -13 |  |
|  | 5770 ≤ f ≤ 5800 | -19 |  |
| NOTE: The minimum requirement when specified as a range denotes the emission requirement at the end points of the protected range. The requirement within the protected range is obtained by linear interpolation between the requirements at the end points. | | | |

### 6.5F.4 Transmit intermodulation for shared spectrum channel access

Editor’s Note: This test is incomplete. The following aspects are not yet determined:

- RB allocation in Test configuration table is TBD

- Message contents and test procedure specific for NR-U is TBD

- MU and TT for >6GHz (band n96) are TBD are working assumption based on analysis of single TE vendor. Values will be revisited once analysis from other TE vendors is available.

6.5F.4.1 Test purpose

To verify that the UE transmit intermodulation does not exceed the described value in the test requirement when UE is operating with shared spectrum channel access.

The transmit intermodulation performance 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 wanted signal and an interfering signal reaching the transmitter via the antenna.

6.5F.4.2 Test applicability

This test case applies to all types of NR UE release 16 and forward that support NR standalone shared spectrum channel access.

6.5F.4.3 Minimum conformance requirements

The requirements for transmit intermodulation in clause 6.5F.4 apply.

The normative reference for this requirement is TS 38.101-1 [2] clause 6.5F.4.

6.5F.4.4 Test description

6.5F.4.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, test channel bandwidths and sub-carrier spacing based on NR operating bands specified in table 5.3.5-1. All of these configurations shall be tested with applicable test parameters for each combination of channel bandwidth and sub-carrier spacing and are shown in table 6.5F.4.4.1-1. The details of the uplink reference measurement channels (RMCs) are specified in Annexes A.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Table 6.5F.4.4.1-1: Test Configuration Table

|  |  |  |  |
| --- | --- | --- | --- |
| Initial Conditions | | | |
| Test Environment as specified in TS 38.508-1 [5] subclause 4.1 | | Normal | |
| Test Frequencies as specified in TS 38.508-1 [5] subclause 4.3.1 | | Mid range | |
| Test Channel Bandwidths as specified in TS 38.508-1 [5] subclause 4.3.1 | | 20 MHz, Highest | |
| Test SCS as specified in Table 5.3.5-1 | | Lowest, Highest | |
| Test Parameters | | | |
| Test ID | Downlink Configuration | Uplink Configuration | |
|  | N/A for transmit intermodulation test case | Modulation | RB allocation (NOTE 1) |
| 1 | DFT-s-OFDM PI/2 BPSK | Outer Full |
| 2 | DFT-s-OFDM QPSK | Outer Full |
| NOTE 1: The specific configuration of each RB allocation is defined in Table 6.1-1. | | | |

1. Connect the SS to the UE antenna connectors as shown in TS 38.508-1 [5] Annex A, in Figure A.3.1.3.1 for TE diagram and section A.3.2 for UE diagram.

2. The parameter settings for the cell are set up according to TS 38.508-1 [5] subclause 4.4.3.

3. Downlink signals are initially set up according to Annex C.0, C.1, C.2, and uplink signals according to Annex G.0, G.1, G.2, G.3.0.

4. The UL Reference Measurement channels are set according to Table 6.5F.4.4.1-1.

5. Propagation conditions are set according to Annex B.0.

6. Ensure the UE is in State RRC\_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On,* Test Mode *On* and Test Loop Function *On* according to TS 38.508-1 [5] clause 4.5. Message contents are defined in clause 6.5F.4.4.3.

6.5F.4.4.2 Test procedure

1. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0\_1 for C\_RNTI to schedule the UL RMC according to Table 6.5F.4.4.1-1. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC.

2. Send continuously uplink power control "up" commands to the UE until the UE transmits at its PUMAX level.

3. Measure the rectangular filtered mean power of the UE. For TDD, only slots consisting of only UL symbols are under test for the wanted signal and for the intermodulation product.

4. Set the interference signal frequency below the UL carrier frequency using the first offset in table 6.5F.4.5-1.

5. Set the interference CW signal level according to table 6.5F.4.5-1.

6. Search the intermodulation product signals below and above the UL carrier frequency, then measure the rectangular filtered mean power of transmitting intermodulation for both signals and calculate the ratios with the power measured in step 3.

7. Set the interference signal frequency above the UL carrier frequency using the first offset in table 6.5F.4.5-1.

8. Search the intermodulation product signals below and above the UL carrier frequency, then measure the rectangular filtered mean power of transmitting intermodulation for both signals and calculate the ratios with the power measured in step 3.

9. Repeat the measurement using the second offset in table 6.5F.4.5-1.

6.5F.4.4.3 Message contents

Message contents are according to TS 38.508-1 [5] subclause 4.6 with the following exception:

Table 6.5F.4.4.3-1: *PUSCH-Config*

|  |
| --- |
| Derivation Path: TS 38.508-1 [5], Table 4.6.3-118 with condition TRANSFORM\_PRECODER\_ENABLED |

6.5F.4.5 Test requirement

The ratio derived in step 6 and 8, shall not exceed the described value in table 6.5F.4.5-1.

Table 6.5F.4.5-1: Transmit Intermodulation

|  |  |  |
| --- | --- | --- |
| Wanted signal  channel bandwidth | BWChannel | |
| Interference signal  frequency offset from channel centre | BWChannel | 2\*BWChannel |
| Interference CW signal level | -40dBc | |
| Intermodulation product | < -29dBc | < -35dBc |
| Measurement bandwidth | The maximum transmission bandwidth configuration among the different SCSs for the channel BW as defined in Table 6.5F.2.4.1.5-1 | |
| Measurement offset from channel centre | BWChannel and 2\*BWChannel | 2\*BWChannel and 4\*BWChannel |
| Note 1: The test requirements do not apply when the interfering signal overlaps with the channel bandwidth of the downlink signal. | | |

## 6.5G Output RF spectrum emissions for Tx Diversity

### 6.5G.1 Occupied bandwidth for Tx Diversity

6.5G.1.1 Test purpose

To verify that the UE occupied bandwidth for Tx Diversity for all transmission bandwidth configurations supported by the UE are less than their specific limits.

6.5G.1.2 Test applicability

This test case applies to all types of NR Power Class 1.5 UE, Power Class 2 and Power Class 3 UE release 15 and forward that support Tx diversity.

6.5G.1.3 Minimum conformance requirements

For UE supporting Tx diversity, the requirements for occupied bandwidth apply to the transmitted spectrum as measured as the sum of the power from all UE transmit antenna connectors. The occupied bandwidth is defined as the bandwidth containing 99 % of the total integrated mean power of the transmitted spectrum on the assigned channel at each transmit antenna connector.

The normative reference for this requirement is TS 38.101-1 [2] clause 6.5G.1.

6.5G.1.4 Test description

Same test description as specified in clause 6.5.1.4 with following exceptions:

Step 3 of Test procedure as in 6.5.1.4.2 is replaced by:

3. Measure the power spectrum distribution as the sum of the power from all UE transmit antenna connectors within two times or more range over the requirement for Occupied Bandwidth specification centring on the current carrier frequency. The characteristics of the filter shall be approximately Gaussian (typical spectrum analyser filter). Other methods to measure the power spectrum distribution are allowed. The measuring duration is at least 1ms over consecutive active uplink slots.

6.5G.1.5 Test requirement

The measured Occupied Bandwidth shall not exceed values in Table 6.5.1.5-1.

### 6.5G.2 Out of band emission for Tx Diversity

#### 6.5G.2.1 Spectrum emission mask for Tx Diversity

6.5G.2.1.1 Test purpose

Same test purpose as in 6.5.2.2.1.

6.5G.2.1.2 Test applicability

This test case applies to all types of NR Power Class 1.5, Power Class 2 and Power Class 3 UE release 15 and forward that support Tx diversity.

6.5G.2.1.3 Minimum conformance requirements

For UE supporting Tx diversity, the requirements for Out of band emissions resulting from the modulation process and non-linearity in the transmitters apply to the sum of the emissions from all UE transmit antenna connectors.

If UE indicates Tx diversity capability, Adjacent Channel Leakage power Ratio (ACLR) is defined as the ratio of sum of the filtered mean power at each antenna connector centred on the assigned channel frequency to sum of the filtered mean power at each antenna connector centred on an adjacent channel frequency.

The normative reference for this requirement is TS 38.101-1 [2] clause 6.5G.2.1

6.5G.2.1.4 Test description

6.5G.2.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, test channel bandwidths and sub-carrier spacing based on NR operating bands specified in table 5.3.5-1. All of these configurations shall be tested with applicable test parameters for each combination of channel bandwidth and sub-carrier spacing, are shown in table 6.5G.2.1.4.1-1, 6.5G.2.1.4.1-2, 6.5G.2.1.4.1-2a and Table 6.5G.2.1.4.1-3. The details of the uplink reference measurement channels (RMCs) are specified in Annexes A.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2

Table 6.5G.2.1.4.1-1: Test Configuration Table for power class 3 (contiguous allocation)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Default Conditions | | | | | | |
| Test Environment as specified in TS 38.508-1 [5] subclause 4.1 | | | | | Normal | |
| Test Frequencies as specified in TS 38.508-1 [5] subclause 4.3.1 | | | | | Low range, High range | |
| Test Channel Bandwidths as specified in TS 38.508-1 [5] subclause 4.3.1 | | | | | Lowest, Highest | |
| Test SCS as specified in Table 5.3.5-1 | | | | | Lowest, Highest | |
| Test Parameters for Channel Bandwidths | | | | | | |
| Test ID | Freq | ChBw | SCS | Downlink Configuration | Uplink Configuration | |
|  |  | Default | Default | N/A for Spectrum Emission Mask test case | Modulation (NOTE 2) | RB allocation (NOTE 1) |
| 13 | Low |  |  | DFT-s-OFDM PI/2 BPSK | Edge\_1RB\_Left |
| 23 | High |  |  | DFT-s-OFDM PI/2 BPSK | Edge\_1RB\_Right |
| 33 | Default |  |  | DFT-s-OFDM PI/2 BPSK | Outer\_Full |
| 44 | Low |  |  |  | DFT-s-OFDM PI/2 BPSK | Edge\_1RB\_Left |
| 54 | High |  |  |  | DFT-s-OFDM PI/2 BPSK | Edge\_1RB\_Right |
| 64 | Default |  |  |  | DFT-s-OFDM PI/2 BPSK | Outer\_Full |
| 7 | Low |  |  |  | DFT-s-OFDM QPSK | Edger\_1RB\_Left |
| 8 | High |  |  | DFT-s-OFDM QPSK | Edge\_1RB\_Right |
| 9 | Default |  |  | DFT-s-OFDM QPSK | Outer\_Full |
| 10 | Low |  |  | DFT-s-OFDM 16 QAM | Edge\_1RB\_Left |
| 11 | High |  |  | DFT-s-OFDM 16 QAM | Edge\_1RB\_Right |
| 12 | Default |  |  | DFT-s-OFDM 16 QAM | Outer\_Full |
| 13 | Low |  |  | DFT-s-OFDM 64 QAM | Edge\_1RB\_Left |
| 14 | High |  |  | DFT-s-OFDM 64 QAM | Edge\_1RB\_Right |
| 15 | Default |  |  | DFT-s-OFDM 64 QAM | Outer\_Full |
| 16 | Low |  |  | DFT-s-OFDM 256 QAM | Edge\_1RB\_Left |
| 17 | High |  |  | DFT-s-OFDM 256 QAM | Edge\_1RB\_Right |
| 18 | Default |  |  | DFT-s-OFDM 256 QAM | Outer\_Full |
| 19 | Low |  |  | CP-OFDM QPSK | Edge\_1RB\_Left |
| 20 | High |  |  | CP-OFDM QPSK | Edge\_1RB\_Right |
| 21 | Default |  |  | CP-OFDM QPSK | Outer\_Full |
| 22 | Low |  |  | CP-OFDM 16 QAM | Edge\_1RB\_Left |
| 23 | High |  |  | CP-OFDM 16 QAM | Edge\_1RB\_Right |
| 24 | Default |  |  | CP-OFDM 16 QAM | Outer\_Full |
| 25 | Low |  |  | CP-OFDM 64 QAM | Edge\_1RB\_Left |
| 26 | High |  |  | CP-OFDM 64 QAM | Edge\_1RB\_Right |
| 27 | Default |  |  | CP-OFDM 64 QAM | Outer\_Full |
| 28 | Low |  |  | CP-OFDM 256 QAM | Edge\_1RB\_Left |
| 29 | High |  |  | CP-OFDM 256 QAM | Edge\_1RB\_Right |
| 30 | Default |  |  | CP-OFDM 256 QAM | Outer\_Full |
| 315,6 | Low |  |  |  | DFT-s-OFDM Pi/2 BPSK w Pi/2 BPSK DMRS | Edge\_1RB\_Left |
| 325,6 | High |  |  |  | DFT-s-OFDM Pi/2 BPSK w Pi/2 BPSK DMRS | Edge\_1RB\_Right |
| 335,6 | Default |  |  |  | DFT-s-OFDM Pi/2 BPSK w Pi/2 BPSK DMRS | Outer Full |
| NOTE 1: The specific configuration of each RF allocation is defined in Table 6.1-1.  NOTE 2: DFT-s-OFDM PI/2 BPSK test applies only for UEs which supports half Pi BPSK in FR1.  NOTE 3: UE operating in TDD mode with Pi/2 BPSK modulation and UE indicates support for UE capability *powerBoosting-pi2BPSK* and the IE *powerBoostPi2BPSK* is set to 1 for bands n40, n41, n77, n78 and n79.  NOTE 4: UE operating in FDD mode, or in TDD mode in bands other than n40, n41, n77, n78 and n79, or in TDD mode the IE *powerBoostPi2BPSK* is set to 0 for bands n40, n41, n77, n78 and n79.  NOTE 5: For Power Class 3 testing, UE operating in FDD mode, or in TDD mode in bands other than n40, n41, n77, n78 and n79, or in TDD mode the IE *powerBoostPi2BPSK* is set to 0 for bands n40, n77, n78 and n79.  NOTE 6: Applicable to UEs indicating support for UE capability *lowPAPR-DMRS-PUSCHwithPrecoding-r16*.  NOTE 7: It is essential that all test points in this table also exist in table 6.2G.2.4.1-2a. | | | | | | |

Table 6.5G.2.1.4.1-2: Test Configuration Table for power class 2 (contiguous allocation)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Initial Conditions | | | | |
| Test Environment as specified in TS 38.508-1 [5] subclause 4.1 | | | Normal | |
| Test Frequencies as specified in TS 38.508-1 [5] subclause 4.3.1 | | | Low range, High range | |
| Test Channel Bandwidths as specified in TS 38.508-1 [5] subclause 4.3.1 | | | Lowest, Highest | |
| Test SCS as specified in Table 5.3.5-1 | | | Lowest, Highest | |
| Test Parameters for Channel Bandwidths | | | | |
| Test ID | Freq | Downlink Configuration | Uplink Configuration | |
|  |  | N/A | Modulation (NOTE 2) | RB allocation (NOTE 1) |
| 1 | Low |  | DFT-s-OFDM Pi/2 BPSK | Edge\_1RB\_Left |
| 2 | High |  | DFT-s-OFDM Pi/2 BPSK | Edge\_1RB\_Right |
| 3 | Default |  | DFT-s-OFDM Pi/2 BPSK | Outer Full |
| 4 | Low |  | DFT-s-OFDM QPSK | Edge\_1RB\_Left |
| 5 | High |  | DFT-s-OFDM QPSK | Edge\_1RB\_Right |
| 6 | Default |  | DFT-s-OFDM QPSK | Outer Full |
| 7 | Low |  | DFT-s-OFDM 16 QAM | Edge\_1RB\_Left |
| 8 | High |  | DFT-s-OFDM 16 QAM | Edge\_1RB\_Right |
| 9 | Default |  | DFT-s-OFDM 16 QAM | Outer Full |
| 10 | Low |  | DFT-s-OFDM 64 QAM | Edge\_1RB\_Left |
| 11 | High |  | DFT-s-OFDM 64 QAM | Edge\_1RB\_Right |
| 12 | Default |  | DFT-s-OFDM 64 QAM | Outer Full |
| 13 | Low |  | DFT-s-OFDM 256 QAM | Edge\_1RB\_Left |
| 14 | High |  | DFT-s-OFDM 256 QAM | Edge\_1RB\_Right |
| 15 | Default |  | DFT-s-OFDM 256 QAM | Outer Full |
| 16 | Low |  | CP-OFDM QPSK | Edge\_1RB\_Left |
| 17 | High |  | CP-OFDM QPSK | Edge\_1RB\_Right |
| 18 | Default |  | CP-OFDM QPSK | Outer Full |
| 19 | Low |  | CP-OFDM 16 QAM | Edge\_1RB\_Left |
| 20 | High |  | CP-OFDM 16 QAM | Edge\_1RB\_Right |
| 21 | Default |  | CP-OFDM 16 QAM | Outer Full |
| 22 | Low |  | CP-OFDM 64 QAM | Edge\_1RB\_Left |
| 23 | High |  | CP-OFDM 64 QAM | Edge\_1RB\_Right |
| 24 | Default |  | CP-OFDM 64 QAM | Outer Full |
| 25 | Low |  | CP-OFDM 256 QAM | Edge\_1RB\_Left |
| 26 | High |  | CP-OFDM 256 QAM | Edge\_1RB\_Right |
| 27 | Default |  | CP-OFDM 256 QAM | Outer Full |
| NOTE 1: The specific configuration of each RB allocation is defined in Table 6.1-1.  NOTE 2: DFT-s-OFDM Pi/2 BPSK test applies only for UEs which supports half Pi BPSK in FR1.  NOTE 3: It is essential that all test points in this table also exist in table 6.2G.2.4.1-1. | | | | |

Table 6.5G.2.1.4.1-3: Test Configuration Table for power class 1.5 (contiguous allocation)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Initial Conditions | | | | |
| Test Environment as specified in TS 38.508-1 [5] subclause 4.1 | | | Normal | |
| Test Frequencies as specified in TS 38.508-1 [5] subclause 4.3.1 | | | Low range, High range | |
| Test Channel Bandwidths as specified in TS 38.508-1 [5] subclause 4.3.1 | | | Lowest, Highest | |
| Test SCS as specified in Table 5.3.5-1 | | | Lowest, Highest | |
| Test Parameters for Channel Bandwidths | | | | |
| Test ID | Freq | Downlink Configuration | Uplink Configuration | |
|  |  | N/A for Spectrum Emission Mask test case | Modulation (NOTE 2) | RB allocation (NOTE 1) |
| 1 | Low | DFT-s-OFDM Pi/2 BPSK | Edge\_1RB\_Left |
| 2 | High | DFT-s-OFDM Pi/2 BPSK | Edge\_1RB\_Right |
| 3 | Default | DFT-s-OFDM Pi/2 BPSK | Outer Full |
| 4 | Low | DFT-s-OFDM QPSK | Edge\_1RB\_Left |
| 5 | High | DFT-s-OFDM QPSK | Edge\_1RB\_Right |
| 6 | Default | DFT-s-OFDM QPSK | Outer Full |
| 7 | Low | DFT-s-OFDM 16 QAM | Edge\_1RB\_Left |
| 8 | High | DFT-s-OFDM 16 QAM | Edge\_1RB\_Right |
| 9 | Default | DFT-s-OFDM 16 QAM | Outer Full |
| 10 | Low | DFT-s-OFDM 64 QAM | Edge\_1RB\_Left |
| 11 | High | DFT-s-OFDM 64 QAM | Edge\_1RB\_Right |
| 12 | Default | DFT-s-OFDM 64 QAM | Outer Full |
| 13 | Low | DFT-s-OFDM 256 QAM | Edge\_1RB\_Left |
| 14 | High | DFT-s-OFDM 256 QAM | Edge\_1RB\_Right |
| 15 | Default | DFT-s-OFDM 256 QAM | Outer Full |
| 16 | Low | CP-OFDM QPSK | Edge\_1RB\_Left |
| 17 | High | CP-OFDM QPSK | Edge\_1RB\_Right |
| 18 | Default | CP-OFDM QPSK | Outer Full |
| 19 | Low | CP-OFDM 16 QAM | Edge\_1RB\_Left |
| 20 | High | CP-OFDM 16 QAM | Edge\_1RB\_Right |
| 21 | Default | CP-OFDM 16 QAM | Outer Full |
| 22 | Low | CP-OFDM 64 QAM | Edge\_1RB\_Left |
| 23 | High | CP-OFDM 64 QAM | Edge\_1RB\_Right |
| 24 | Default | CP-OFDM 64 QAM | Outer Full |
| 25 | Low | CP-OFDM 256 QAM | Edge\_1RB\_Left |
| 26 | High | CP-OFDM 256 QAM | Edge\_1RB\_Right |
| 27 | Default | CP-OFDM 256 QAM | Outer Full |
| 28 | Low | DFT-s-OFDM Pi/2 BPSK w Pi/2 BPSK DMRS | Edge\_1RB\_Left |
| 29 | High | DFT-s-OFDM Pi/2 BPSK w Pi/2 BPSK DMRS | Edge\_1RB\_Right |
| 30 | Default | DFT-s-OFDM Pi/2 BPSK w Pi/2 BPSK DMRS | Outer Full |
| NOTE 1: The specific configuration of each RB allocation is defined in Table 6.1-1.  NOTE 2: DFT-s-OFDM Pi/2 BPSK test applies only for UEs which supports half Pi BPSK in FR1.  NOTE 3: Applicable to UEs indicating support for UE capability *lowPAPR-DMRS-PUSCHwithPrecoding-r16*.  NOTE 4: It is essential that all test points in this table also exist in table 6.2G.2.4.1-2. | | | | |

Table 6.5G.2.1.4.1-4: Test Configuration Table for power class 2&3 (almost contiguous allocation)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Initial Conditions | | | | |
| Test Environment as specified in TS 38.508-1 [5] subclause 4.1 | | | Normal | |
| Test Frequencies as specified in TS 38.508-1 [5] subclause 4.3.1 | | | Low range, High range | |
| Test Channel Bandwidths as specified in TS 38.508-1 [5] subclause 4.3.1 | | | Highest | |
| Test SCS as specified in Table 5.3.5-1 | | | Lowest, Highest | |
| Test Parameters for Channel Bandwidths | | | | |
| Test ID | Freq | Downlink Configuration | Uplink Configuration | |
|  |  | N/A | Modulation | RB allocation (NOTE 1) |
| 1 | Default |  | CP-OFDM QPSK | Inner Full |
| 2 | Default |  | CP-OFDM QPSK | Outer Full |
| 3 | Default |  | CP-OFDM 16 QAM | Inner Full |
| 4 | Default |  | CP-OFDM 16 QAM | Outer Full |
| 5 | Default |  | CP-OFDM 64 QAM | Outer Full |
| 6 | Default |  | CP-OFDM 256 QAM | Outer Full |
| NOTE 1: The specific configuration of each RB allocation is defined in Table 6.2G.2.4.1-4.  NOTE 2: It is essential that all test points in this table also exist in table 6.2G.2.4.1-3.  NOTE 3: Test applies only for UEs which support almost contiguous UL CP-OFDM transmissions. For PC2 UE which support almost contiguous UL CP-OFDM transmissions, test is only applicable for Release 16 and forward. | | | | |

1. Connect the SS to the UE antenna connectors as shown in TS 38.508-1 [5] Annex A, Figure A.3.1.1.1 for TE diagram and section A.3.2 for UE diagram.

2. The parameter settings for the cell are set up according to TS 38.508-1 [5] subclause 4.4.3.

3. Downlink signals are initially set up according to Annex C.0, C.1, C.2 and uplink signals according to Annex G.0, G.1, G.2, G.3.0.

4. The UL Reference Measurement channels are set according to Table 6.5G.2.1.4.1-1.

5. Propagation conditions are set according to Annex B.0.

6. Ensure the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On*, Test Mode *On* and Test Loop Function *On* according to TS 38.508-1 [5] clause 4.5. Message contents are defined in clause 6.5G.2.1.4.3.

6.5G.2.1.4.2 Test procedure

1. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0\_1 for C\_RNTI to schedule the UL RMC according to Table 6.5G.2.1.4.1-1, Table 6.5G.2.1.4.1-2, Table 6.5G.2.1.4.1-3 and Table 6.5G.2.1.4.1-4. Since the UL has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC.

2. Send continuously power control “up” commands to the UE until the UE transmits at PUMAX level. Allow at least 200ms for the UE to reach PUMAX level.

3. Measure the sum of the mean power of the UE from both transmit antenna connectors in the channel bandwidth of the radio access mode according to the test configuration, which shall meet the requirements described in clause 6.2G.2.5. The period of the measurement shall be at least the continuous duration of 1ms over consecutive active uplink slots. For TDD, only slots consisting of only UL symbols are under test.

4. Measure the sum of the mean power of the transmitted signal from both transmit antenna connectors with a measurement filter of bandwidths according to table 6.5G.2.1.5-1 and using a rms detector. If the sweep count is higher than one, the trace mode shall be average. The centre frequency of the filter shall be stepped in continuous steps according to the same table. The measured power shall be recorded for each step. The measurement period shall capture the active TSs.

NOTE 1: When switching to DFT-s-OFDM waveform, as specified in the test configuration table 6.5G.2.1.4.1-1, table 6.5G.2.1.4.1-2, and table 6.5G.2.1.4.1-2a, send an NR RRCReconfiguration message according to TS 38.508-1 [5] clause 4.6.3 Table 4.6.3-118 PUSCH-Config with TRANSFORM\_PRECODER\_ENABLED condition.

6.5G.2.1.4.3 Message contents

Message contents are according to TS 38.508-1 [5] subclause 4.6 with the following exceptions:

Table 6.5G.2.1.4.3-1: *PUSCH-Config*

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [5] subclause 4.6.3 Table 4.6.3-118 PUSCH-Config | | | |
| Information Element | Value/remark | Comment | Condition |
| PUSCH-Config ::= SEQUENCE { |  |  |  |
| resourceAllocation | resourceAllocationType0 |  | Almost contiguous allocation |
|  | resourceAllocationType1 |  | Contiguous allocation |
| } |  |  |  |

Table 6.5G.2.1.4.3-2: DMRS-UplinkConfig (Test ID 31 – 33 in Table 6.5G.2.1.4.1-1)

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [5], Table 4.6.3-51 | | | |
| Information Element | Value/remark | Comment | Condition |
| DMRS-UplinkConfig ::= SEQUENCE { |  |  |  |
| transformPrecodingEnabled SEQUENCE { |  |  |  |
| dmrs-UplinkTransformPrecoding-r16 SEQUENCE { |  |  |  |
| pi2BPSK-ScramblingID0 | Not present |  |  |
| pi2BPSK-ScramblingID1 | Not present |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |

6.5G.2.1.5 Test requirement

The measured UE mean power in the channel bandwidth, derived in step 3, shall fulfil requirements in clause 6.2G.2.5 as appropriate, and the power of any UE emission shall fulfil requirements in Table 6.5G.2.1.5-1.

Table 6.5G.2.1.5-1: General NR spectrum emission mask

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| ΔfOOB  (MHz) | Channel bandwidth (MHz) / Spectrum emission limit (dBm) | | | Measurement bandwidth |
| 5 | 10, 15, 20, 25, 30, 40, 45 | 50, 60, 70, 80, 90, 100 |
| ± 0-1 | -13 + TT | -13 + TT |  | 1 % of channel BW |
| ± 0-1 |  |  | -24 + TT | 30 kHz |
| ± 1-5 | -10 + TT | -10 + TT | | 1 MHz |
| ± 5-6 | -13 + TT |  | |
| ± 6-10 | -25 + TT |  | |
| ± 5-BWChannel |  | -13 + TT | |
| ± BWChannel-(BWChannel+5) |  | -25 + TT | |
| Note 1: The first and last measurement position with a 30 kHz filter is at ΔfOOB equals to 0.015 MHz and 0.985 MHz.  Note 2: At the boundary of spectrum emission limit, the first and last measurement position with a 1 MHz filter is the inside of +0.5MHz and -0.5MHz, respectively.  Note 3: The measurements are to be performed above the upper edge of the channel and below the lower edge of the channel.  Note 4: TT for each frequency and channel bandwidth is specified in Table 6.5G.2.1.5-2. | | | | |

Table 6.5G.2.1.5-2: Test Tolerance (Spectrum Emission Mask)

|  |  |  |  |
| --- | --- | --- | --- |
|  | f ≤ 3.0GHz | 3.0GHz < f ≤ 4.2GHz | 4.2GHz < f ≤ 6.0GHz |
| BW ≤ 100MHz | 1.5 dB | 1.8 dB | 1.8 dB |

NOTE: As a general rule, the resolution bandwidth of the measuring equipment should be equal to the measurement bandwidth. However, to improve measurement accuracy, sensitivity and efficiency, the resolution bandwidth may be smaller than the measurement bandwidth. When the resolution bandwidth is smaller than the measurement bandwidth, the result should be integrated over the measurement bandwidth in order to obtain the equivalent noise bandwidth of the measurement bandwidth.

#### 6.5G.2.2 Additional spectrum emission mask for Tx Diversity

Editor’s Note: The following aspects are either missing or not yet determined:

- Tests for network signalling values other than NS\_04 are incomplete due to lack of test requirement in 6.2G.3.

6.5G.2.2.1 Test purpose

The same test purpose as in 6.5.2.3.1.

6.5G.2.2.2 Test applicability

This test case applies to all types of NR Power Class 1.5, Power Class 2 and Power Class 3 UE release 15 and forward that support Tx diversity.

6.5G.2.2.3 Minimum conformance requirements

For UE supporting Tx diversity, the requirements for Out of band emissions resulting from the modulation process and non-linearity in the transmitters apply to the sum of the emissions from all UE transmit antenna connectors.

If UE indicates IE Tx diversity capability, Adjacent Channel Leakage power Ratio (ACLR) is defined as the ratio of sum of the filtered mean power at each antenna connector centred on the assigned channel frequency to sum of the filtered mean power at each antenna connector centred on an adjacent channel frequency.

The normative reference for this requirement is TS 38.101-1 [2] clause 6.5G.2.

6.5G.2.2.4 Test description

Same test description as specified in clause 6.5.2.3.4 with following exceptions:

Step 3 and 4 of Test procedure as in 6.5.2.3.4.2 is replaced by:

3. Measure the mean power of the UE as the sum of the power from all UE transmit antenna connectors in the channel bandwidth of the radio access mode according to the test configuration, which shall meet the requirements described in applicable table of clause 6.2G.3.5. The period of measurement shall be at least the continuous duration one sub-frame (1ms). For TDD slots with transient periods are not under test.

4. Measure the power of the transmitted signal as the sum of the power from all UE transmit antenna connectors with a measurement filter of bandwidths according to applicable test configuration tables in subclause 6.5G.2.2.5 and using a rms detector. If the sweep count is higher than one, the trace mode shall be average. The centre frequency of the filter shall be stepped in continuous steps according to the applicable test requirement table. The measured power shall be recorded for each step. The measurement period shall capture the active TSs.

6.5G.2.2.5 Test requirement

Table 6.5G.2.2.5-1: Test Tolerance (Additional spectrum emission mask)

|  |  |  |  |
| --- | --- | --- | --- |
|  | f ≤ 3.0GHz | 3.0GHz < f ≤ 4.2GHz | 4.2GHz < f ≤ 6.0GHz |
| BW ≤ 100MHz | 1.5 dB | 1.8 dB | 1.8 dB |

6.5G.2.2.5.1 Test requirements (network signalling value "NS\_35")

When "NS\_35" is indicated in the cell:

- the measured UE mean power in the channel bandwidth, derived in step 3, shall fulfil requirements in table FFS as appropriate for a NR UE.

and

- the power of any UE emission shall fulfil requirements in table 6.5G.2.2.5.1-1, as applicable.

Table 6.5G.2.2.5.1-1: Additional test requirements "NS\_35"

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Spectrum emission limit (dBm) / Channel bandwidth | | | | | |
| ΔfOOB  (MHz) | 5 MHz | 10 MHz | 15 MHz | 20 MHz | Measurement bandwidth (unless otherwise stated) |
| ± 0-0.1 | -15.0 + TT | -18.0 + TT | -20.0 + TT | -21.0 + TT | 30 kHz |
| ± 0.1-6 | -13.0 + TT- | -13.0 + TT | -13.0 + TT | -13.0 + TT | 100 kHz |
| ± 6-10 | -251 + TT | -13.0 + TT | -13.0 + TT | -13.0 + TT | 100 kHz |
| ± 10-15 |  | -251 + TT | -13.0 + TT | -13.0 + TT | 100 kHz |
| ± 15-20 |  |  | -251 + TT | -13.0 + TT | 100 kHz |
| ± 20-25 |  |  |  | -25 + TT | 1 MHz |
| NOTE 1: The measurement bandwidth shall be 1 MHz.  NOTE 2: TT for each frequency and channel bandwidth is specified in Table 6.5G.2.2.5-1. | | | | | |

NOTE: As a general rule, the resolution bandwidth of the measuring equipment should be equal to the measurement bandwidth. However, to improve measurement accuracy, sensitivity and efficiency, the resolution bandwidth may be smaller than the measurement bandwidth. When the resolution bandwidth is smaller than the measurement bandwidth, the result should be integrated over the measurement bandwidth in order to obtain the equivalent noise bandwidth of the measurement bandwidth.

6.5G.2.2.5.2 Test requirements (network signalling value "NS\_04")

When "NS\_04" is indicated in the cell:

- the measured UE mean power in the channel bandwidth, derived in step 3, shall fulfil requirements in Table 6.2G.3.5-1 for UE power class 2, Table 6.2G.3.5-2 for UE power class 1.5 or Table FFS for UE power class 3.

and

- the power of any UE emission shall fulfil requirements in table 6.5G.2.2.5.2-1.

Table 6.5G.2.2.5.2-1: Additional test requirements for "NS\_04"

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| ΔfOOB  MHz |  | Spectrum emission limit (dBm) / measurement bandwidth  for each channel bandwidth (MHz) | | | | | | | | | | | Measurement bandwidth |
|  | 10 | 15 | 20 | 30 | 40 | 50 | | 60 | 70 | 80 | 90 | 100 |  |
| ± 0 - 1 | -10+TT | -10+TT | -10+TT | -10+TT | -10+TT |  |  | | | | | | 2 % channel bandwidth |
|  |  |  |  |  |  |  | -10 | | | | | | 1 MHz |
| ± 1 - 5 |  | -10 + TT | | | | | | | | | | | 1 MHz |
| ± 5 - X |  | -13 + TT | | | | | | | | | | |
| ± X - (BWChannel + 5 MHz) |  | -25 + TT | | | | | | | | | | |
| NOTE 1: X is defined in Table 6.5.2.3.3.2-1 for CP-OFDM and 6.5.2.3.3.2-2 for DFT-S-OFDM.  NOTE 2: TT for each frequency and channel bandwidth is specified in Table 6.5G.2.2.5-1. | | | | | | | | | | | | | |

6.5G.2.2.5.3 Test requirements (network signalling value "NS\_03", "NS\_03U" and "NS\_21")

When "NS\_03" or "NS\_03U" or “NS\_21” is indicated in the cell:

- the measured UE mean power in the channel bandwidth, derived in step 3, shall fulfil requirements in table FFS as appropriate for a NR UE.

and

- the power of any UE emission shall fulfil requirements in table 6.5G.2.2.5.3-1, as applicable.

Table 6.5G.2.2.5.3-1: Additional requirements for "NS\_03", "NS\_03U" and "NS\_21"

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| ΔfOOB  MHz | Channel bandwidth (MHz) / Spectrum emission limit (dBm) | | | | | | | Measurement bandwidth |
|  | 5 | 10 | 15 | 20 | 25 | 30 | 40 |  |
| ± 0-1 | -13 + TT | -13 + TT | -13 + TT | -13 + TT | -13 + TT | -13 + TT | -13 + TT | 1 % of channel BW |
| ± 1-6 | -13 + TT | -13 + TT | -13 + TT | -13 + TT | -13 + TT | -13 + TT | -13 + TT | 1 MHz |
| ± 6-10 | -25 + TT | -13 + TT | -13 + TT | -13 + TT | -13 + TT | -13 + TT | -13 + TT | 1 MHz |
| ± 10-15 |  | -25 + TT | -13 + TT | -13 + TT | -13 + TT | -13 + TT | -13 + TT | 1 MHz |
| ± 15-20 |  |  | -25 + TT | -13 + TT | -13 + TT | -13 + TT | -13 + TT | 1 MHz |
| ± 20-25 |  |  |  | -25 + TT | -13 + TT | -13 + TT | -13 + TT | 1 MHz |
| ± 25-30 |  |  |  |  | -25 + TT | -13 + TT | -13 + TT | 1 MHz |
| ± 30-35 |  |  |  |  |  | -25 + TT | -13 + TT | 1 MHz |
| ± 35-40 |  |  |  |  |  |  | -13 + TT | 1 MHz |
| ± 40-45 |  |  |  |  |  |  | -25 + TT | 1 MHz |
| NOTE 1: TT for each frequency and channel bandwidth is specified in Table 6.5G.2.2.5-1. | | | | | | | | |

NOTE: As a general rule, the resolution bandwidth of the measuring equipment should be equal to the measurement bandwidth. However, to improve measurement accuracy, sensitivity and efficiency, the resolution bandwidth may be smaller than the measurement bandwidth. When the resolution bandwidth is smaller than the measurement bandwidth, the result should be integrated over the measurement bandwidth in order to obtain the equivalent noise bandwidth of the measurement bandwidth.

6.5G.2.2.5.4 Test requirements (network signalling value "NS\_06")

When "NS\_06" is indicated in the cell:

- the measured UE mean power in the channel bandwidth, derived in step 3, shall fulfil requirements in table FFS as appropriate for a NR UE

and

- the power of any UE emission shall fulfil requirements in table 6.5G.2.2.5.4-1, as applicable.

Table 6.5G.2.2.5.4-1: Additional requirements for "NS\_06"

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Spectrum emission limit (dBm) / Channel bandwidth | | | | |
| ΔfOOB  (MHz) | 5 MHz | 10 MHz | 15 MHz | Measurement  bandwidth |
| ± 0 – 0.1 | -15 + TT | -18 + TT | -20 + TT | 30 kHz |
| ± 0.1 – 1 | -13 + TT | -13 + TT | -13 + TT | 100 kHz |
| ± 1 – 6 | -13 + TT | -13 + TT | -13 + TT | 1 MHz |
| ± 6 – 10 | -25 + TT | -13 + TT | -13 + TT | 1 MHz |
| ± 10 – 15 |  | -25 + TT | -13 + TT | 1 MHz |
| ± 15 – 20 |  |  | -25 + TT | 1 MHz |
| NOTE 1: TT for each frequency and channel bandwidth is specified in Table 6.5G.2.2.5-1. | | | | |

NOTE: As a general rule, the resolution bandwidth of the measuring equipment should be equal to the measurement bandwidth. However, to improve measurement accuracy, sensitivity and efficiency, the resolution bandwidth may be smaller than the measurement bandwidth. When the resolution bandwidth is smaller than the measurement bandwidth, the result should be integrated over the measurement bandwidth in order to obtain the equivalent noise bandwidth of the measurement bandwidth.

#### 6.5G.2.3 Adjacent channel leakage ratio for Tx Diversity

If UE indicates IE Tx diversity capability, Adjacent Channel Leakage power Ratio (ACLR) is defined as the ratio of sum of the filtered mean power at each antenna connector centred on the assigned channel frequency to sum of the filtered mean power at each antenna connector centred on an adjacent channel frequency.

##### 6.5G.2.3.1 NR ACLR for Tx Diversity

6.5G.2.3.1.1 Test purpose

To verify that UE transmitter does not cause unacceptable interference to adjacent channels in terms of Adjacent Channel Leakage power Ratio (ACLR).

6.5G.2.3.1.2 Test applicability

This test case applies to all types of NR Power Class 1.5 UE, Power Class 2 and Power Class 3 UE release 15 and forward that support Tx diversity.

6.5G.2.3.1.3 Minimum conformance requirements

NR adjacent channel leakage power ratio (NRACLR) is the ratio of sum of the filtered mean power at each antenna connector centred on the assigned NR channel frequency to sum of the filtered mean power at each antenna connector centred on an adjacent NR channel frequency at nominal channel spacing.

The assigned NR channel power and adjacent NR channel power are measured with rectangular filters with measurement bandwidths specified in Table 6.5G.2.3.1.3-1.

If the measured adjacent channel power is greater than –50dBm then the NRACLR shall be higher than the value specified in Table 6.5G.2.3.1.3-2.

Table 6.5G.2.3.1.3-1: NR ACLR measurement bandwidth

|  |  |  |  |
| --- | --- | --- | --- |
| Channel bandwidth | (MHz) | 5,10,15,20,25,30,35,40,45,50 | 60,70,80,90,100 |
| REF\_SCS | (kHz) | 15 | 30 |
| NR ACLR measurement bandwidth | (MHz) | MBW=REF\_SCS\*(12\*NRB+1)/1000 | |

Table 6.5G.2.3.1.3-2: NR ACLR requirement

|  |  |  |  |
| --- | --- | --- | --- |
|  | Power class 1.5 | Power class 2 | Power class 3 |
| NR ACLR | 31 dB | 31 dB | 30 dB |

The normative reference for this requirement is TS 38.101-1 [2] clause 6.5G.2.3.1.

6.5G.2.3.1.4 Test description

6.5G.2.3.1.4.1 Initial conditions

Same initial conditions as 6.2G.2.4.1.

6.5G.2.3.1.4.2 Test procedure

1. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0\_1 for C\_RNTI to schedule the UL RMC according to the test configuration tables in clause 6.2.2.4.1. Since the UL has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC.

2. Send continuously power control “up” commands to the UE until the UE transmits at PUMAX level. Allow at least 200ms for the UE to reach PUMAX level.

3. Measure the sum of the mean power of the UE at each antenna connector in the channel bandwidth of the radio access mode according to the test configuration, as measured in step 3 of 6.2G.2.4.2, which shall meet the requirements described in clause 6.2G.2.5 as appropriate.

4. Measure the sum of the rectangular filtered mean power at each antenna connector for the assigned NR channel using a rms detector. If the sweep count is higher than one, the trace mode shall be average.

5. Measure the sum of the rectangular filtered mean power at each antenna connector of the first NR adjacent channel on both lower and upper side of the assigned NR channel using a rms detector, respectively. If the sweep count is higher than one, the trace mode shall be average.

6. Calculate the ratios of the power between the values measured in step 4 over step 5 for lower and upper NR ACLR, respectively.

NOTE 1: When switching to DFT-s-OFDM waveform, as specified in the test configuration tables in clause 6.2.2.4.1, send an NR RRCReconfiguration message according to TS 38.508-1 [5] clause 4.6.3 Table 4.6.3-118 PUSCH-Config with TRANSFORM\_PRECODER\_ENABLED condition.

6.5G.2.3.1.4.3 Message contents

Message contents are according to TS 38.508-1 [5] subclause 4.6 and 5.4 with the following exceptions:

Table 6.5G.2.3.1.4.3-1: *PUSCH-Config*

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [5] subclause 4.6.3 Table 4.6.3-118 PUSCH-Config | | | |
| Information Element | Value/remark | Comment | Condition |
| PUSCH-Config ::= SEQUENCE { |  |  |  |
| resourceAllocation | resourceAllocationType0 |  | Almost contiguous allocation |
|  | resourceAllocationType1 |  | Contiguous allocation |
| } |  |  |  |

6.5G.2.3.1.5 Test requirement

The measured UE mean power in the channel bandwidth, derived in step 3, shall fulfil requirements in clause 6.2G.2.5 as appropriate, and if the measured adjacent channel power is greater than –50 dBm then the measured NR ACLR, derived in step 6, shall be higher than the limits in Table 6.5G.2.3.1.5-2 with TT applying for the sum of power at each of UE antenna connector.

Table 6.5G.2.3.1.5-1: NR ACLR measurement bandwidth

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| NR channel bandwidth / NR ACLR measurement bandwidth | | | | | | | | | | | | | |
|  | 5 MHz | 10 MHz | 15 MHz | 20 MHz | 25 MHz | 30 MHz | 40 MHz | 50 MHz | 60 MHz | 70 MHz | 80 MHz | 90 MHz | 100 MHz |
| NR ACLR measurement bandwidth  (MHz) | 4.515 | 9.375 | 14.235 | 19.095 | 23.955 | 28.815 | 38.895 | 48.615 | 58.35 | 68.07 | 78.15 | 88.23 | 98.31 |

Table 6.5G.2.3.1.5-2: NR ACLR requirement for Tx Diversity

|  |  |  |  |
| --- | --- | --- | --- |
|  | Power class 1.5 | Power class 2 | Power class 3 |
| NR ACLR | 31 - TT dB | 31 - TT dB | 30 - TT dB |
| NOTE 1: TT for each frequency and channel bandwidth is specified in Table 6.5G.2.3.1.5-3.  NOTE 2: TT for the sum of power at each of UE antenna connector. | | | |

Table 6.5G.2.3.1.5-3: Test Tolerance (NR ACLR)

|  |  |  |  |
| --- | --- | --- | --- |
|  | f ≤ 3.0GHz | 3.0GHz < f ≤ 4.2GHz | 4.2GHz < f ≤ 6.0GHz |
| BW ≤ 100MHz | 0.8 dB | 0.8 dB | 0.8 dB |

##### 6.5G.2.3.2 UTRA ACLR for Tx Diversity

6.5G.2.3.2.1 Test purpose

To verify that UE transmitter does not cause unacceptable interference to adjacent channels in terms of Adjacent Channel Leakage power Ratio (ACLR).

6.5G.2.3.2.2 Test applicability

This test case applies for network signalling values NS\_03U, NS\_05U, NS\_43U, and NS\_100 to all types of NR Power Class 3 UE release 15 and forward that support Tx diversity.

6.5G.2.3.2.3 Minimum conformance requirements

For UE supporting Tx diversity, the requirements for Out of band emissions resulting from the modulation process and non-linearity in the transmitters apply to the sum of the emissions from all UE transmit antenna connectors.

If UE indicates IE *txDiversity-r16*, Adjacent Channel Leakage power Ratio (ACLR) is defined as the ratio of sum of the filtered mean power at each antenna connector centred on the assigned channel frequency to sum of the filtered mean power at each antenna connector centred on an adjacent channel frequency.

The requirements specified in clause 6.5.2 apply.

The normative reference for this requirement is TS 38.101-1 [2] clause 6.5G.2.

6.5G.2.3.2.4 Test description

Same test description as specified in clause 6.5.2.4.2.4 with following exceptions:

Step 3, 4 and 5 of Test procedure as in 6.5.1.4.2 is replaced by:

3. Measure the mean power of the UE as the sum of the power from all UE transmit antenna connectors in the channel bandwidth of the radio access mode according to the test configuration, which shall meet the requirements described in 6.2.3.5 as appropriate. The period of the measurement shall be at least the continuous duration of one active sub-frame (1ms) and in the uplink symbols. For TDD slots with transient periods are not under test.

4. Measure the rectangular filtered mean power as the sum of the power from all UE transmit antenna connectors for the assigned NR channel using a rms detector. If the sweep count is higher than one, the trace mode shall be average.

5. Measure the RRC filtered mean power as the sum of the power from all UE transmit antenna connectors of the first and the second UTRA adjacent channel on both lower and upper side of the NR channel using a rms detector, respectively. If the sweep count is higher than one, the trace mode shall be average.

6.5G.2.3.2.5 Test requirement

The measured UE mean power in the channel bandwidth, derived in step 3, shall fulfil requirements described in clause 6.2G.3.5 as appropriate, and if the measured adjacent channel power is greater than –50 dBm then the measured UTRA ACLR, derived in step 6, shall be higher than the limits in table 6.5G.2.3.2.5-1.

Table 6.5G.2.3.2.5-1: UTRA ACLR requirement

|  |  |
| --- | --- |
|  | Power class 3 |
| UTRAACLR1 | 33 dB -TT |
| UTRAACLR2 | 36 dB - TT |
| NOTE 1: TT = 0.8 dB | |

### 6.5G.3 Spurious emission for Tx Diversity

#### 6.5G.3.1 General spurious emissions for Tx Diversity

6.5G.3.1.1 Test purpose

To verify that UE transmitter does not cause unacceptable interference to other channels or other systems in terms of transmitter spurious emissions.

6.5G.3.1.2 Test applicability

This test case applies to all types of NR Power Class 1.5 UE, Power Class 2 and Power Class 3 UE release 15 and forward that support Tx diversity.

6.5G.3.1.3 Minimum conformance requirements

For UE supporting Tx diversity, the requirements for Spurious emissions which are caused by unwanted transmitter effects such as harmonics emission, parasitic emissions, intermodulation products and frequency conversion products apply to the sum of the emissions from all UE transmit antenna connectors.

The normative reference for this requirement is TS 38.101-1 [2] subclause 6.5G.3.

6.5G.3.1.4 Test description

Same test description as specified in clause 6.5.3.1.4 with following exceptions:

Step 3 of Test procedure as in 6.5.3.1.4.2 is replaced by:

3. Measure the sum power of the transmitted signal at all antenna connectors with a measurement filter of bandwidths according to Table 6.5G.3.1.5-1. The centre frequency of the filter shall be stepped in contiguous steps according to Table 6.5G.3.1.5-1. The measured power shall be verified for each step. The measurement period shall capture the active time slots. During measurement the spectrum analyser shall be set to 'Detector' = RMS. If the sweep count is higher than one, the trace mode shall be average.

6.5G.3.1.5 Test requirement

The measured average power of spurious emission, derived in step 3, shall not exceed the described value in Table 6.5G.3.1.5-1.

Table 6.5G.3.1.5-1: General spurious emissions for Tx Diversity test requirements

|  |  |  |  |
| --- | --- | --- | --- |
| Frequency Range | Maximum Level | Measurement bandwidth | NOTE |
| 9 kHz ≤ f < 150 kHz | -36 dBm | 1 kHz |  |
| 150 kHz ≤ f < 30 MHz | -36 dBm | 10 kHz |  |
| 30 MHz ≤ f < 1000 MHz | -36 dBm | 100 kHz |  |
| 1 GHz ≤ f < 12.75 GHz | -30 dBm | 1 MHz | 4 |
| -25 dBm | 1 MHz | 3 |
| 12.75 GHz ≤ f < 5th harmonic of the upper frequency edge of the UL operating band in GHz | -30 dBm | 1 MHz | 1 |
| 12.75 GHz < f < 26 GHz | -30 dBm | 1 MHz | 2 |
| NOTE 1: Applies for Band for which the upper frequency edge of the UL Band is greater than 2.55 GHz and less than or equal to 5.2 GHz  NOTE 2: Applies for Band that the upper frequency edge of the UL Band more than 5.2 GHz  NOTE 3: Applies for Band n41, CA configurations including Band n41, and EN-DC configurations that include n41 specified in sub-clause 5.2B of 38.101-3 [4] when NS\_04 is signalled.  NOTE 4: Does not apply for Band n41, CA configurations including Band n41, and EN-DC configurations that include n41 specified in subclause 5.2B of TS 38.101-3 [4] when NS\_04 is signalled. | | | |

#### 6.5G.3.2 Spurious emissions for UE co-existence for Tx Diversity

6.5G.3.2.1 Test purpose

To verify that UE transmitter does not cause unacceptable interference to co-existing systems for the specified bands which has specific requirements in terms of transmitter spurious emissions.

6.5G.3.2.2 Test applicability

This test case applies to all types of NR Power Class 1.5, Power Class 2 and Power Class 3 UE release 15 and forward that support Tx diversity.

6.5G.3.2.3 Minimum conformance requirements

For UE supporting Tx diversity, the requirements for Spurious emissions which are caused by unwanted transmitter effects such as harmonics emission, parasitic emissions, intermodulation products and frequency conversion products apply to the sum of the emissions from all UE transmit antenna connectors.

The requirements specified in clause 6.5.3 apply.

The normative reference for this requirement is TS 38.101-1 [2] subclause 6.5G.3.

6.5G.3.2.4 Test description

Same test description as specified in clause 6.5.3.2.4 with following exceptions:

Step 3 of Test procedure as in 6.5.3.2.4.2 is replaced by:

3. Measure the sum power of the transmitted signal at all antenna connectors with a measurement filter of bandwidths according to table 6.5.3.2.3-1 to 6.5.3.2.3-3. The centre frequency of the filter shall be stepped in contiguous steps according to table 6.5.3.2.3-1 to 6.5.3.2.3-3. The measured power shall be verified for each step. The measurement period shall capture the active time slots. During measurement the spectrum analyser shall be set to 'Detector' = RMS. If the sweep count is higher than one, the trace mode shall be average.

6.5G.3.2.5 Test requirement

Test requirements for Spurious Emissions UE Co-existence are the same as the minimum requirements and are not repeated in this section.

Unless otherwise stated, the spurious emission limits apply for the frequency ranges that are more than FOOB (MHz) in Tables 6.5.3.1.3-1 from the edge of the channel bandwidth. The spurious emission limits in Tables 6.5.3.2.3-1 to 6.5.3.2.3-3 apply for all transmitter band configurations (NRB) and channel bandwidths.

The measured average power of spurious emission, derived in step 3, shall not exceed the described value in Table 6.5.3.2.3-1 to 6.5.3.2.3-3 for difference releases.

The requirements for the UE are release specific and can be found in Tables 6.5.3.2.3-1 to 6.5.3.2.3-3. If the UE support a band, which is not defined in the table corresponding UE’s release, the requirements for this band are taken from the table of earliest release where requirements for this band are defined. This has been described in following Table 6.5G.3.2.5-1.

Table 6.5G.3.2.5-1: UE Requirements according to UE NR release and supported E-UTRA and NR band

|  |  |  |  |
| --- | --- | --- | --- |
| UE Requirements per release | | | |
| NR Band | Rel-15 | Rel-16 | R17 |
| n1 | Table 6.5.3.2.3-1 | Table 6.5.3.2.3-2 | Table 6.5.3.2.3-3 |
| n2 | Table 6.5.3.2.3-1 | Table 6.5.3.2.3-2 | Table 6.5.3.2.3-3 |
| n3 | Table 6.5.3.2.3-1 | Table 6.5.3.2.3-2 | Table 6.5.3.2.3-3 |
| n5 | Table 6.5.3.2.3-1 | Table 6.5.3.2.3-2 | Table 6.5.3.2.3-3 |
| n7 | Table 6.5.3.2.3-1 | Table 6.5.3.2.3-2 | Table 6.5.3.2.3-3 |
| n8 | Table 6.5.3.2.3-1 | Table 6.5.3.2.3-2 | Table 6.5.3.2.3-3 |
| n12 | Table 6.5.3.2.3-1 | Table 6.5.3.2.3-2 | Table 6.5.3.2.3-3 |
| n14 | Table 6.5.3.2.3-2 | Table 6.5.3.2.3-2 | Table 6.5.3.2.3-3 |
| n18 | Table 6.5.3.2.3-2 | Table 6.5.3.2.3-2 | Table 6.5.3.2.3-3 |
| n20 | Table 6.5.3.2.3-1 | Table 6.5.3.2.3-2 | Table 6.5.3.2.3-3 |
| n24 | Table 6.5.3.2.3-3 | Table 6.5.3.2.3-3 | Table 6.5.3.2.3-3 |
| n25 | Table 6.5.3.2.3-1 | Table 6.5.3.2.3-2 | Table 6.5.3.2.3-3 |
| n26 | Table 6.5.3.2.3-2 | Table 6.5.3.2.3-2 | Table 6.5.3.2.3-3 |
| n28 | Table 6.5.3.2.3-1 | Table 6.5.3.2.3-2 | Table 6.5.3.2.3-3 |
| n30 | Table 6.5.3.2.3-2 | Table 6.5.3.2.3-2 | Table 6.5.3.2.3-3 |
| n34 | Table 6.5.3.2.3-1 | Table 6.5.3.2.3-2 | Table 6.5.3.2.3-3 |
| n38 | Table 6.5.3.2.3-1 | Table 6.5.3.2.3-2 | Table 6.5.3.2.3-3 |
| n39 | Table 6.5.3.2.3-1 | Table 6.5.3.2.3-2 | Table 6.5.3.2.3-3 |
| n40 | Table 6.5.3.2.3-1 | Table 6.5.3.2.3-2 | Table 6.5.3.2.3-3 |
| n41 | Table 6.5.3.2.3-1 | Table 6.5.3.2.3-2 | Table 6.5.3.2.3-3 |
| n48 | Table 6.5.3.2.3-2 | Table 6.5.3.2.3-2 | Table 6.5.3.2.3-3 |
| n50 | Table 6.5.3.2.3-1 | Table 6.5.3.2.3-2 | Table 6.5.3.2.3-3 |
| n51 | Table 6.5.3.2.3-1 | Table 6.5.3.2.3-2 | Table 6.5.3.2.3-3 |
| n53 | Table 6.5.3.2.3-2 | Table 6.5.3.2.3-2 | Table 6.5.3.2.3-3 |
| n65 | Table 6.5.3.2.3-2 | Table 6.5.3.2.3-2 | Table 6.5.3.2.3-3 |
| n66 | Table 6.5.3.2.3-1 | Table 6.5.3.2.3-2 | Table 6.5.3.2.3-3 |
| n70 | Table 6.5.3.2.3-1 | Table 6.5.3.2.3-2 | Table 6.5.3.2.3-3 |
| n71 | Table 6.5.3.2.3-1 | Table 6.5.3.2.3-2 | Table 6.5.3.2.3-3 |
| n74 | Table 6.5.3.2.3-1 | Table 6.5.3.2.3-2 | Table 6.5.3.2.3-3 |
| n77, n78 | Table 6.5.3.2.3-1 | Table 6.5.3.2.3-2 | Table 6.5.3.2.3-3 |
| n79 | Table 6.5.3.2.3-1 | Table 6.5.3.2.3-2 | Table 6.5.3.2.3-3 |
| NOTE 1: The frequency range applicable with network signalling values of NS\_04, NS\_17, NS\_18, NS\_05, NS\_43, NS\_37, NS\_38, NS\_39, NS\_40, NS\_41, NS\_42, NS\_45 and NS\_56 are covered in subclause 6.5.3.3 Additional Spurious Emissions  NOTE 2: The restriction on the maximum uplink transmission to 54 RB in Notes 21 and 22 of Tables 6.5G.3.2.3-1 to 6.5G.3.2.3-3 is intended for conformance testing and may be applied to network operation to facilitate coexistence when the aggressor and victim bands are deployed in the same geographical area. The applicable spurious emission requirement of -15.5 dBm/5MHz is a least restrictive technical condition for FDD/TDD coexistence and may have to be revised in the future. | | | |

#### 6.5G.3.3 Additional spurious emissions for Tx Diversity

Editor’s note: The following aspects are either missing or not yet determined:

- Tests for network signalling values other than NS\_04 are incomplete due to lack of test requirement in 6.2G.3.

6.5G.3.3.1 Test purpose

To verify that UE transmitter does not cause unacceptable interference to other channels or other systems in terms of transmitter spurious emissions under the deployment scenarios where additional requirements are specified.

6.5G.3.3.2 Test applicability

This test case applies to all types of NR Power Class 1.5, Power Class 2 and Power Class 3 UE release 15 and forward that support Tx diversity.

6.5G.3.3.3 Minimum conformance requirements

For UE supporting Tx diversity, the requirements for Spurious emissions which are caused by unwanted transmitter effects such as harmonics emission, parasitic emissions, intermodulation products and frequency conversion products apply to the sum of the emissions from all UE transmit antenna connectors.

The requirements specified in clause 6.5.3.3 apply.

The normative reference for this requirement is TS 38.101-1 [2] subclause 6.5G.3.

6.5G.3.3.4 Test description

Same test description as specified in clause 6.5.3.3.4 with following exceptions:

Steps 3 and 4 of Test procedure as in 6.5.3.3.4.2 is replaced by:

3. Measure the sum of the mean power of the UE at each antenna connector in the channel bandwidth of the radio access mode, which shall meet the requirements described in Clauses 6.2G.3.5. The period of measurement shall be at least the continuous duration of 1ms over consecutive active uplink slots and uplink symbols. For TDD, only slots consisting of only UL symbols are under test.

4. Measure the sum power of the transmitted signal at all antenna connectors with a measurement filter of bandwidths according to Tables 6.5.3.3.3.1 to 6.5.3.3.3.27 as appropriate. The centre frequency of the filter shall be stepped in contiguous steps according to the same table the measured power shall be verified for each step. The measurement period shall capture the active time slots. During measurement the spectrum analyser shall be set to 'Detector' = RMS. If the sweep count is higher than one, the trace mode shall be average.

6.5G.3.3.5 Test requirement

This clause specifies the requirements for the specified NR band for an additional spectrum emission requirement with protected bands as indicated from Table 6.5.3.3.5.1 to Table 6.5.3.3.5.27 for different NS\_values.

The measured UE mean power in the channel bandwidth, derived in step 3, shall fulfil requirements specified as 6.2G.3.5.

The measured power derived in step 4 shall meet the requirements for the specified NR band for an additional spurious emission requirement with protected bands as indicated in clause 6.5.3.3.5 for different NS values.

NOTE: For measurement conditions at the edge of each frequency range, the lowest frequency of the measurement position in each frequency range should be set at the lowest boundary of the frequency range plus MBW/2. The highest frequency of the measurement position in each frequency range should be set at the highest boundary of the frequency range minus MBW/2. MBW denotes the measurement bandwidth defined for the protected band.

### 6.5G.4 Transmit intermodulation for Tx Diversity

6.5G.4.1 Test purpose

To verify that the UE transmit intermodulation for Tx Diversity does not exceed the described value in the test requirement.

The transmit intermodulation performance 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 wanted signal and an interfering signal reaching the transmitter via the antenna.

6.5G.4.2 Test applicability

This test case applies to all types of NR Power Class 1.5 UE, Power Class 2 and Power Class 3 UE release 15 and forward that support Tx diversity.

6.5G.4.3 Minimum conformance requirements

For UE supporting Tx diversity, the transmit intermodulation requirements are specified at each transmit antenna connector and the wanted signal is defined as the sum of output power from all UE transmit antenna connectors.

The normative reference for this requirement is TS 38.101-1 [2] clause 6.5G.4.

6.5G.4.4 Test description

Same test description as specified in clause 6.5.4.4 with following exceptions:

Test procedure as in 6.5.4.4.2 is replaced by:

1. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0\_1 for C\_RNTI to schedule the UL RMC according to Table 6.5.4.4.1-1. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC.

2. Send continuously uplink power control "up" commands to the UE until the UE transmits at its PUMAX level.

3. Measure the rectangular filtered mean power at each antenna connector of the UE. For TDD, only slots consisting of only UL symbols are under test for the wanted signal and for the intermodulation product.

4. Set the interference signal frequency below the UL carrier frequency using the first offset in table 6.5.4.5-1.

5. Set the interference CW signal level according to table 6.5.4.5-1.

6. Search the intermodulation product signals below and above the UL carrier frequency at each UE antenna connector, then measure the rectangular filtered mean power at each antenna connector of transmitting intermodulation for both signals, and calculate the ratios with the power measured in step 3.

7. Set the interference signal frequency above the UL carrier frequency using the first offset in table 6.5.4.5-1.

8. Search the intermodulation product signals below and above the UL carrier frequency at each UE antenna connector, then measure the rectangular filtered mean power at each antenna connector of transmitting intermodulation for both signals, and calculate the ratios with the power measured in step 3.

9. Repeat the measurement using the second offset in table 6.5.4.5-1.

10. Repeat step 3) until 9) for each of transmit antenna of the UE.

6.5G.4.5 Test requirement

The ratio derived in step 6 and 8, shall not exceed the described value in table 6.5.4.5-1.

## 6.5H Output RF spectrum emissions for CA with UL MIMO

### 6.5H.1 Output RF spectrum emissions for intra-band UL contiguous CA with UL MIMO

#### 6.5H.1.1 Occupied bandwidth for intra-band UL contiguous CA for UL MIMO

Editor’s Note:

- Due to lack of MPR requirements in core specification, this test case is incomplete for intra-band contiguous UL CA for power class 2 UEs indicating IE dualPA-Architecture supported, and power class 3 UEs when signalling is absent for dualPA-Architecture.

- MU needs to be reassessed.

6.5H.1.1.1 Test purpose

To verify that the UE occupied bandwidth for all transmission bandwidth configurations supported by the UE are less than their specific limits for 2 UL CA.

6.5H.1.1.2 Test applicability

This test case applies to all types of NR UE release 15 and forward that supports intra-band UL contiguous CA with UL MIMO.

6.5H.1.1.3 Minimum conformance requirements

For UE supporting intra-band UL contiguous CA and UL MIMO, the requirements for occupied bandwidth specified in clause 6.5A.1.0.1a apply to the sum of the powers from both UE transmit antenna connectors and all UL CCs. The requirements shall be met with UL MIMO configurations described in clause 6.2H.1.1.

If UE is scheduled for single antenna-port PUSCH transmission by DCI format 0\_0 or by DCI format 0\_1 for single antenna port codebook based transmission with precoding matrix *W*=1 [6.3.1.5 TS 38.211], the requirements in clause 6.5A.1.0.1a apply.

The normative reference for this requirement is TS 38.101-1 [2] clause 6.5H.1.1.

6.5H.1.1.4 Test description

Same test description as specified in clause 6.5A.1.1.4 for intra-band contiguous CA with following exceptions:

For initial conditions:

- Connect the SS to the UE antenna connectors as shown in TS 38.508-1 [5] Annex A, Figure A.3.1.1.6 for TE diagram and section A.3.2.3.11 for UE diagram.

For test procedures:

- Step 4 in 6.5A.1.1.4.2 is replaced by:

4. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0\_1 for C\_RNTI to schedule the UL RMC according to Table 6.5A.1.1.4.1-2 on both PCC and SCC as appropriate. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC. The PDCCH DCI format 0\_1 is specified with the condition 2TX\_UL\_MIMO in 38.508-1 [5] subclause 4.3.6.1.1.2.

- Step 6 in 6.5A.1.1.4.2 is replaced by:

6. Measure the power spectrum distribution as the sum of the powers from both UE transmit antenna connectors over all component carriers within two times or more range over the aggregated channel bandwidth requirement for Occupied Bandwidth specification centring on the centre of aggregated channel bandwidth. The characteristics of the filter shall be approximately Gaussian (typical spectrum analyser filter). Other methods to measure the power spectrum distribution are allowed. The measuring duration is at least 1ms over consecutive active uplink slots.

For message contents:

- Message contents are according to TS 38.508-1 [5] subclause 4.6 and 5.4 ensuring Table 4.6.3-182 with the condition 2TX\_UL\_MIMO with the following exceptions:

Table 6.5H.1.1.4-1: FrequencyInfoUL-SIB for intra-band contiguous CA with UL MIMO of Power Class 3 (contiguous RB allocation) for CA\_n41C

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [5] Table 4.6.3-62 FrequencyInfoUL-SIB | | | |
| Information Element | Value/remark | Comment | Condition |
| p-Max | 10 |  |  |

Table 6.5H.1.1.4-2: FrequencyInfoUL-SIB for intra-band contiguous CA with UL MIMO of Power Class 2 (contiguous RB allocation) for CA\_n41C

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [5] Table 4.6.3-62 FrequencyInfoUL-SIB | | | |
| Information Element | Value/remark | Comment | Condition |
| p-Max | 12 |  |  |

6.5H.1.1.5 Test requirements

For intra-band contiguous carrier aggregation with UL MIMO, the measured Occupied Bandwidth shall not exceed the aggregated channel bandwidth as defined in subclause 5.3A.3.

#### 6.5H.1.2 Out of band emission for intra-band UL contiguous CA for UL MIMO

##### 6.5H.1.2.0 Minimum conformance requirements

For UE supporting intra-band UL contiguous CA and UL MIMO, the requirements for Out of band emissions resulting from the modulation process and non-linearity in the transmitters is defined as the sum of the emissions from both UE transmit antenna connectors and all UL CCs, the requirements in subclause 6.5A.2.2.0, 6.5A.2.3.0 and 6.5A.2.4.1.0 apply. The requirements shall be met with UL MIMO configurations described in clause 6.2H.1.1.

If UE is scheduled for single antenna-port PUSCH transmission by DCI format 0\_0 or by DCI format 0\_1 for single antenna port codebook based transmission with precoding matrix *W*=1 [6.3.1.5 TS 38.211], the requirements in clause 6.5A.2.2.0, 6.5A.2.3.0 and 6.5A.2.4.1.0 apply.

The normative reference for this requirement is TS 38.101-1 [2] clause 6.5H.1.2.

##### 6.5H.1.2.1 Spectrum emission mask for intra-band UL contiguous CA for UL MIMO

6.5H.1.2.1.1 Test purpose

To verify that the power of any UE emission shall not exceed specified level for the specified channel bandwidth for intra-band UL contiguous CA for UL MIMO.

6.5H.1.2.1.2 Test applicability

This test case applies to all types of NR UE release 15 and forward that support intra-band UL contiguous CA with UL MIMO.

6.5H.1.2.1.3 Minimum conformance requirements

The minimum conformance requirements are defined in subclause 6.5H.1.2.0.

6.5H.1.2.1.4 Test description

6.5H.1.2.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, test channel bandwidths and sub-carrier spacing based on NR CA configuration specified in clause 5.5A. All of these configurations shall be tested with applicable test parameters for each CA configuration of test channel bandwidth and sub-carrier spacing, and are shown in Table 6.5H.1.2.1.4.1-1. The details of the uplink reference measurement channels (RMCs) are specified in Annexes A.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Table 6.5H.1.2.1.4.1-1: Test Configuration Table (contiguous RB allocation)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Initial Conditions | | | | | |
| Test Environment as specified in TS 38.508-1 [5] subclause 4.1 | | | Normal | | |
| Test Frequencies as specified in TS 38.508-1 [5] subclause 4.3.1 | | | Low range  High range | | |
| Test Channel Bandwidths as specified in TS 38.508-1 [5] subclause 4.3.1 | | | Lowest NRB\_agg, Highest NRB\_agg  (NOTE 1) | | |
| Test SCS as specified in Table 5.3.5-1 | | | Lowest, Highest | | |
| Test Parameters for CA bandwidth class B and C | | | | | |
| Test ID | DL configuration | UL configuration | | | |
|  | for PCC & SCC | Modulations for all CCs | | | RB allocation (NOTE 2) |
| 1 |  |  | | QPSK | Outer Full |
| 2 |  | CP-OFDM | | 16QAM | Outer Full |
| 3 |  |  | | 64QAM | Outer Full |
| 4 |  |  | | 256QAM | Outer Full |
| NOTE 1: The Test CC Combination settings are checked separately for each CA Configuration, which applicable aggregated channel bandwidths are specified in Table 5.5A.1-1.  NOTE 2: The specific configuration of each RB allocation is defined in Table 6.1A-1a.  NOTE 3: If the UE supports multiple CC Combinations in the CA Configuration with the same NRB\_agg, only the combination with the highest NRB\_PCC is tested. | | | | | |

1. Connect the SS to the UE antenna connectors as shown in TS 38.508-1 [5] Annex A, Figure A.3.1.1.6 for TE diagram and section A.3.2.3.11 for UE diagram.

2. The parameter settings for the cell are set up according to TS 38.508-1 [5] subclause 4.4.3.

3. Downlink signals for PCC are initially set up according to Annex C.0, C.1, C.2, and uplink signals according to Annex G.0, G.1, G.2, G.3.0.

4. The UL Reference Measurement Channel is set according to Table 6.5H.1.2.1.4.1-1.

5. Propagation conditions are set according to Annex B.0.

6. Ensure the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On,* Test Mode *On* and Test Loop Function *On* according to TS 38.508-1 [5] clause 4.5. Message contents are defined in clause 6.5H.1.2.1.4.3.

6.5H.1.2.1.4.2 Test procedure

1. Configure SCC according to Annex C.0, C.1, and C.2 for all downlink physical channels.

2. The SS shall configure SCC as per TS 38.508-1 [5] clause 5.5.1. Message contents are defined in clause 6.5H.1.2.1.4.3.

3. SS activates SCC by sending the activation MAC CE (Refer TS 38.321 [18], clauses 5.9, 6.1.3.10). Wait for at least 2 seconds (Refer TS 38.133[19], clause 9.3).

4. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0\_1 for C\_RNTI to schedule the UL RMC according to Tables 6.5H.1.2.1.4.1-1 on both PCC and SCC as appropriate. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC. The PDCCH DCI format 0\_1 is specified with the condition 2TX\_UL\_MIMO in 38.508-1 [5] subclause 4.3.6.1.1.2.

5. Send continuously uplink power control "up" commands in every uplink scheduling information to the UE; allow at least 200ms starting from the first TPC command in this step for the UE to reach PUMAX level.

6. Measure the sum of mean power from both antenna connectors and all component carriers in the CA configuration of the radio access mode, which shall meet the requirements described in clause 6.2H.1.2. The period of the measurement shall be at least the continuous duration of one active sub-frame (1ms) and in the uplink symbols. For TDD slots with transient periods are not under test.

7. Measure the sum of power of the transmitted signal at each antenna connector with a measurement filter of bandwidths according to Table 6.5H.1.2.1.5-1 and using a rms detector. If the sweep count is higher than one, the trace mode shall be average. The centre frequency of the filter shall be stepped in continuous steps according to the same table. The measured power shall be recorded for each step. The measurement period shall capture the active TSs.

6.5H.1.2.1.4.3 Message contents

Message contents are according to TS 38.508-1 [5] subclause 4.6 and 5.4 ensuring Table 4.6.3-182 with the condition 2TX\_UL\_MIMO with the following exceptions:

Table 6.5H.1.2.1.4.3-1: FrequencyInfoUL-SIB for intra-band contiguous CA with UL MIMO of Power Class 3 (contiguous RB allocation) for CA\_n41C

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [5] Table 4.6.3-62 FrequencyInfoUL-SIB | | | |
| Information Element | Value/remark | Comment | Condition |
| p-Max | 16 |  | Test IDs 1, 3 |
|  | 14 |  | Test ID 5 |
|  | 11 |  | Test ID 7 |
|  | 10 |  | Test IDs 2, 4, 6, 8 |

Table 6.5H.1.2.1.4.3-2: FrequencyInfoUL-SIB for intra-band contiguous CA with UL MIMO of Power Class 2 (contiguous RB allocation) for CA\_n41C

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [5] Table 4.6.3-62 FrequencyInfoUL-SIB | | | |
| Information Element | Value/remark | Comment | Condition |
| p-Max | 19 |  | Test IDs 1, 3 |
|  | 17 |  | Test ID 5 |
|  | 14 |  | Test ID 7 |
|  | 12 |  | Test IDs 2, 4, 6, 8 |

6.5H.1.2.1.5 Test requirement

The measured UE mean power in the applicable channel bandwidth, derived in step 6, shall fulfil requirements in clause 6.2H.1.2 as appropriate, and the power of any UE emission, derived in step 7, shall fulfil requirements in Table 6.5H.1.2.1.5-1.

Table 6.5H.1.2.1.5-1: NR General spectrum emission mask for intra-band contiguous CA for UL MIMO

|  |  |  |
| --- | --- | --- |
| ΔfOOB  (MHz) | Spectrum emission limit  (dBm) | MBW  (MHz) |
| ± 0 - 1 | -13+TT | Min(0.01\*BWchannel\_CA, 0.4) |
| ± 1 - 5 | -10+TT | 1MHz |
| ± 5 – BWchannel\_CA | -13+TT | 1MH |
| ±BWchannel\_CA- BWchannel\_CA+5 | -25+TT | 1MHz |

Table 6.5H.1.2.1.5-2: Test Tolerance for Spectrum emission mask

|  |  |  |
| --- | --- | --- |
|  | f ≤ 3.0GHz | 3.0GHz < f ≤ 6GHz |
| BW ≤ 40MHz | 1.5 dB | 1.8dB |
| 40MHz < BW ≤ 100MHz | 1.5dB | 1.8dB |

NOTE: As a general rule, the resolution bandwidth of the measuring equipment should be equal to the measurement bandwidth. However, to improve measurement accuracy, sensitivity and efficiency, the resolution bandwidth may be smaller than the measurement bandwidth. When the resolution bandwidth is smaller than the measurement bandwidth, the result should be integrated over the measurement bandwidth in order to obtain the equivalent noise bandwidth of the measurement bandwidth.

##### 6.5H.1.2.2 Additional spectrum emission mask for intra-band UL contiguous CA for UL MIMO

Editor’s note: The following aspects are either missing or not yet determined:

* Tests for network signalling value other than NS\_04 are not complete.

6.5H.1.2.2.1 Test purpose

To verify that the power of any UE emission shall not exceed specified level for the specified channel bandwidth under the deployment scenarios where additional requirements are specified.

6.5H.1.2.2.2 Test applicability

This test case applies for network signalling values CA\_NS\_04 to all types of NR UE release 15 and forward that support intra-band UL contiguous CA with UL MIMO.

6.5H.1.2.2.3 Minimum conformance requirements

The minimum conformance requirements are defined in subclause 6.5H.1.2.0.

6.5H.1.2.2.4 Test description

Same test description as specified in clause 6.5A.2.3.1.4 for intra-band contiguous CA with following exceptions:

For initial conditions:

- For CA\_NS\_04, same test configuration as listed in Table 6.2H.1.3.4.1-1 shall be used with only Test IDs 1~4 tested.

- Connect the SS to the UE antenna connectors as shown in TS 38.508-1 [5] Annex A, Figure A.3.1.1.6 for TE diagram and section A.3.2.3.11 for UE diagram.

- The UL Reference Measurement channels are set according to the test configuration tables in clause 6.2H.1.3.4.1.

For test procedures:

- Step 4 in 6.5A.2.3.1.4.2 is replaced by:

4. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0\_1 for C\_RNTI to schedule the UL RMC according to clause 6.2H.1.3.4.1 on both PCC and SCC as appropriate. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC. The PDCCH DCI format 0\_1 is specified with the condition 2TX\_UL\_MIMO in 38.508-1 [5] subclause 4.3.6.1.1.2.

- Step 6 and 7 in 6.5A.2.3.1.4.2 are replaced by:

6. Measure the sum of mean power from both antenna connectors and all component carriers in the CA configuration of the radio access mode, which shall meet the requirements described in clause 6.2H.1.3. The period of the measurement shall be at least the continuous duration of one active sub-frame (1ms) and in the uplink symbols. For TDD slots with transient periods are not under test.

7. Measure the sum of power of the transmitted signal at each antenna connector with a measurement filter of bandwidths according to Table 6.5H.1.2.2.5.1-1 and using a rms detector. The centre frequency of the filter shall be stepped in continuous steps according to the same table. The measured power shall be recorded for each step. The measurement period shall capture the active TSs.

For message contents:

- Ensuring Table 4.6.3-182 configured with the condition 2TX\_UL\_MIMO

- For CA\_NS\_04, message contents exceptions in 6.2H.1.3.4.3 for Test IDs 1~4 apply.

6.5H.1.2.2.5 Test requirement

Table 6.5H.1.2.2.5-2: Test Tolerance for Spectrum emission mask

|  |  |  |
| --- | --- | --- |
|  | f ≤ 3.0GHz | 3.0GHz < f ≤ 6GHz |
| BW ≤ 40MHz | 1.5 dB | 1.8dB |
| 40MHz < BW ≤ 100MHz | 1.5dB | 1.8dB |

6.5H.1.2.2.5.1 Test requirements (network signalling value "CA\_NS\_04")

When "CA\_NS\_04" is indicated in the cell:

- the measured UE mean power in the channel bandwidth, derived in step 6, shall fulfil requirements in Table 6.2H.1.3.5-1 for UE power class 3 or Table 6.2H.1.3.5-2 for UE power class 2.

and

- the power of any UE emission derived in step 7 shall fulfil requirements in table 6.5H.1.2.2.5.1-1.

Table 6.5H.1.2.2.5.1-1: Additional test requirements for "CA\_NS\_04"

|  |  |  |  |
| --- | --- | --- | --- |
| ΔfOOB  MHz | BWChannel\_CA (MHz) / Spectrum emission limit (dBm) | | Measurement bandwidth |
|  | ≤50 | >50 |  |
| ± 0 – 1 | -10+TT |  | 2 % of BWChannel\_CA |
|  |  | -10+TT | 1 MHz |
| ± 1 – 5 | -10+TT | | 1 MHz |
| ± 5 – X | -13+TT | |  |
| ± X - (BWChannel\_CA + 5 MHz) | -25+TT | |  |
| NOTE 1: X is aggregated bandwidth  NOTE 2: TT for each frequency and channel bandwidth is specified in Table 6.5A.2.3.1.5-1. | | | |

##### 6.5H.1.2.3 NR ACLR for intra-band UL contiguous CA for UL MIMO

Editor’s Note:

- Test tolerance for BW>100M is FFS.

6.5H.1.2.3.1 Test purpose

To verify that UE transmitter does not cause unacceptable interference to adjacent channels in terms of Adjacent Channel Leakage power Ratio (ACLR) for intra-band UL contiguous CA for UL MIMO.

6.5H.1.2.3.2 Test applicability

This test case applies to all types of NR UE release 15 and forward that support intra-band UL contiguous CA with UL MIMO.

6.5H.1.2.3.3 Minimum conformance requirements

For UE supporting intra-band UL contiguous CA and UL MIMO, the requirements for Out of band emissions resulting from the modulation process and non-linearity in the transmitters is defined as the sum of the emissions from both UE transmit antenna connectors and all UL CCs, the requirements in subclause 6.5A.2.4.1.1 apply. The requirements shall be met with UL MIMO configurations described in clause 6.2H.1.1.

If UE is scheduled for single antenna-port PUSCH transmission by DCI format 0\_0 or by DCI format 0\_1 for single antenna port codebook based transmission with precoding matrix *W*=1 [6.3.1.5 TS 38.211], the requirements in clause 6.5A.2.2.1, 6.5A.2.3.1 and 6.5A.2.4.1.1 apply.

The normative reference for this requirement is TS 38.101-1 [2] clause 6.5H.1.2.

6.5H.1.2.3.4 Test description

6.5H.1.2.3.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, test channel bandwidths and sub-carrier spacing based on NR CA configuration specified in clause 5.5A. All of these configurations shall be tested with applicable test parameters for each CA configuration of test channel bandwidth and sub-carrier spacing, and are shown in clause 6.2H.1.2. The details of the uplink reference measurement channels (RMCs) are specified in Annexes A.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

1. Connect the SS to the UE antenna connectors as shown in TS 38.508-1 [5] Annex A, Figure A.3.1.1.6 for TE diagram and section A.3.2.3.11 for UE diagram.

2. The parameter settings for the cell are set up according to TS 38.508-1 [5] subclause 4.4.3.

3. Downlink signals for PCC are initially set up according to Annex C.0, C.1, C.2, and uplink signals according to Annex G.0, G.1, G.2, G.3.0.

4. The UL Reference Measurement Channel is set according to Table 6.2H.1.2.4.1-1.

5. Propagation conditions are set according to Annex B.0.

6. Ensure the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On,* Test Mode *On* and Test Loop Function *On* according to TS 38.508-1 [5] clause 4.5. Message contents are defined in clause 6.5H.1.2.3.4.3.

6.5H.1.2.3.4.2 Test procedure

1. Configure SCC according to Annex C.0, C.1, and C.2 for all downlink physical channels.

2. The SS shall configure SCC as per TS 38.508-1 [5] clause 5.5.1. Message contents are defined in clause 6.5H.1.2.3.4.3.

3. SS activates SCC by sending the activation MAC CE (Refer TS 38.321 [18], clauses 5.9, 6.1.3.10). Wait for at least 2 seconds (Refer TS 38.133[19], clause 9.3).

4. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0\_1 for C\_RNTI to schedule the UL RMC according to Tables 6.2H.1.2.4.1-1 on both PCC and SCC as appropriate. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC. The PDCCH DCI format 0\_1 is specified with the condition 2TX\_UL\_MIMO in 38.508-1 [5] subclause 4.3.6.1.1.2.

5. Send continuously uplink power control "up" commands in every uplink scheduling information to the UE; allow at least 200ms starting from the first TPC command in this step for the UE to reach PUMAX level.

6. Measure the sum of mean power from both antenna connectors and all component carriers in the CA configuration of the radio access mode, which shall meet the requirements described in clause 6.2H.1.2.5. The period of the measurement shall be at least the continuous duration of one active sub-frame (1ms) and in the uplink symbols. For TDD slots with transient periods are not under test.

7. Execute 7a) to 7c):

7a) Measure the sum of rectangular filtered mean power for the assigned NR aggregated channel bandwidth at each antenna connector of UE using a rms detector. If the sweep count is higher than one, the trace mode shall be average.

7b) Measure the sum of rectangular filtered mean power of the first NR adjacent aggregated channel at each antenna connector on both lower and upper side of the assigned NR channel using a rms detector, respectively. If the sweep count is higher than one, the trace mode shall be average.

7c) Calculate the ratios of the power between the values measured in step 7a) over step 7b) for lower and upper CA NRACLR, respectively.

6.5H.1.2.3.4.3 Message contents

Message contents are same as 6.2H.1.2.4.3.

6.5H.1.2.3.5 Test requirement

The measured UE mean power in the channel bandwidth, derived in step 6, shall fulfil requirements in clause 6.2H.1.2 as appropriate, and if the measured adjacent channel power is greater than -50 dBm, then the measured NR ACLR derived in step 7c, shall be higher than the limits in Table 6.5H.1.2.3.5-1 and Table 6.5H.1.2.3.5-2 respectively.

Table 6.5H.1.2.3.5-1: General requirements for power class 3

|  |  |
| --- | --- |
|  | ACLR / Measurement bandwidth |
| CA ACLR | 30 - TT dB |
| CA Measurement bandwidth  (NOTE 1) | Nominal channel space+MBWACLR,low/2+ MBWACLR,high/2 |
| Adjacent channel centre frequency offset (in MHz) | + BWChannel\_CA  /  - BWChannel\_CA |
| Difference between ACLR MBW centre and Fc,low | MBWshift= (MBWACLR\_CA-MBWACLR,low)/2 |
| NOTE 1: MBWACLR,low and MBWACLR,high are the single-channel ACLR measurement bandwidths specified for channel bandwidths BWchannel(low) and BWchannel(high) in 6.5.2.4.1.3, respectively. | |

Table 6.5H.1.2.3.5-2: General requirements for intra-band contiguous CA ACLR power class 2

|  |  |
| --- | --- |
|  | ACLR / Measurement bandwidth |
| CA ACLR | 31 - TT dB |
| CA Measurement bandwidth  (NOTE 1) | Nominal channel space+MBWACLR,low/2+ MBWACLR,high/2 |
| Adjacent channel centre frequency offset (in MHz) | + BWChannel\_CA  /  - BWChannel\_CA |
| Difference between ACLR MBW center and Fc,low | MBWshift= (MBWACLR\_CA-MBWACLR,low)/2 |
| NOTE 1: MBWACLR,low and MBWACLR,high are the single-channel ACLR measurement bandwidths specified for channel bandwidths BWchannel(low) and BWchannel(high) in 6.5.2.4.1.3, respectively. | |

Table 6.5H.1.2.3.5-3: Test Tolerance for NR ACLR

|  |  |  |
| --- | --- | --- |
|  | f ≤ 3.0GHz | 3.0GHz < f ≤ 6GHz |
| BW ≤ 100MHz | 0.8 | 0.8 |
| 100MHz < BW ≤ 200MHz | FFS | FFS |

#### 6.5H.1.3 Spurious emission for intra-band UL contiguous CA for UL MIMO

##### 6.5H.1.3.0 Minimum conformance requirements

For UE supporting intra-band UL contiguous CA and UL MIMO, the requirements for Spurious emissions is defined as the sum of the emissions from both UE transmit antenna connectors and all UL CCs, the requirements specified in subclause 6.5A.3.1.0, 6.5A.3.2.0.1 and 6.5A.3.3.0.1 apply. The requirements shall be met with the UL MIMO configurations described in clause 6.2H.1.1.

If UE is scheduled for single antenna-port PUSCH transmission by DCI format 0\_0 or by DCI format 0\_1 for single antenna port codebook based transmission with precoding matrix *W*=1 [6.3.1.5 TS 38.211], the requirements in clause 6.5A.3.1.0, 6.5A.3.2.0.1 and 6.5A.3.3.0.1 apply.

The normative reference for this requirement is TS 38.101-1 [2] clause 6.5H.1.3.

##### 6.5H.1.3.1 General spurious emissions for intra-band UL contiguous CA for UL MIMO

6.5H.1.3.1.1 Test purpose

To verify that UE transmitter does not cause unacceptable interference to other channels or other systems in terms of transmitter spurious emissions.

6.5H.1.3.1.2 Test applicability

This test case applies to all types of NR UE release 15 and forward that support intra-band UL contiguous CA with UL MIMO.

6.5H.1.3.1.3 Minimum conformance requirements

The minimum conformance requirements are defined in subclause 6.5H.1.3.0.

6.5H.1.3.1.4 Test description

Same test description as specified in clause 6.5A.3.1.1.4 for intra-band contiguous CA with following exceptions:

For initial conditions:

- Connect the SS to the UE antenna connectors as shown in TS 38.508-1 [5] Annex A, Figure A.3.1.1.6 for TE diagram and section A.3.2.3.11 for UE diagram.

For test procedures:

- Step 4 in 6.5A.3.1.1.4.2 is replaced by:

4. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0\_1 for C\_RNTI to schedule the UL RMC according to Table 6.5A.3.1.1.4.1-2 on both PCC and SCC as appropriate. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC. The PDCCH DCI format 0\_1 is specified with the condition 2TX\_UL\_MIMO in 38.508-1 [5] subclause 4.3.6.1.1.2.

- Step 6 in 6.5A.3.1.1.4.2 is replaced by:

6. Measure the sum of power of the transmitted signal at each antenna connector with a measurement filter of bandwidths according to Table 6.5H.1.3.1.5-1 for intra-band non-contiguous CA. The centre frequency of the filter shall be stepped in contiguous steps according to Table 6.5H.1.3.1.5-1.

The measured power shall be verified for each step. The measurement period shall capture the active time slots. During measurement the spectrum analyser shall be set to 'Detector' = RMS.

For message contents:

- Ensuring Table 4.6.3-182 configured with the condition 2TX\_UL\_MIMO

6.5H.1.3.1.5 Test requirement

This clause specifies the requirements for the specified NR band for Transmitter Spurious emissions requirement with frequency range as indicated in Table 6.5H.1.3.1.5-1 for intra-band contiguous UL CA configuration. The test requirement of configurations for CA operating band including Band n41 also apply for the corresponding CA operating bands with Band n90 replacing Band n41.

For intra-band contiguous CA, the spurious emission limits apply for the frequency ranges that are more than ΔfOOB (MHz) in Table 6.5A.3.1.0-1 from the edge of the aggregated channel bandwidth.

The measured average power of spurious emission, derived in step 6, shall not exceed the described value in Table 6.5H.1.3.1.5-1 for intra-band contiguous UL CA.

Table 6.5H.1.3.1.5-0: Test Tolerance for General spurious emissions

|  |  |  |
| --- | --- | --- |
|  | f ≤ 3.0GHz | 3.0GHz < f ≤ 6GHz |
| BW ≤ 40MHz | 0 | 0 |
| 40MHz < BW ≤ 100MHz | 0 | 0 |

Table 6.5H.1.3.1.5-1: General spurious emissions test requirements for intra-band contiguous and non-contiguous UL CA

|  |  |  |  |
| --- | --- | --- | --- |
| Frequency Range | Maximum Level | Measurement bandwidth | NOTE |
| 9 kHz ≤ f < 150 kHz | -36 dBm | 1 kHz |  |
| 150 kHz ≤ f < 30 MHz | -36 dBm | 10 kHz |  |
| 30 MHz ≤ f < 1000 MHz | -36 dBm | 100 kHz |  |
| 1 GHz ≤ f < 12.75 GHz | -30 dBm | 1 MHz | 4 |
| -25 dBm | 1 MHz | 3 |
| 12.75 GHz ≤ f < 5th harmonic of the upper frequency edge of the UL operating band in GHz | -30 dBm | 1 MHz | 1 |
| 12.75 GHz < f < 26 GHz | -30 dBm | 1 MHz | 2 |
| NOTE 1: Applies for Band for which the upper frequency edge of the UL Band is greater than 2.55 GHz and less than or equal to 5.2 GHz  NOTE 2: Applies for Band that the upper frequency edge of the UL Band more than 5.2 GHz  NOTE 3: Applies for Band n41, CA configurations including Band n41, and EN-DC configurations that include n41 specified in sub-clause 5.2B of [4] when NS\_04 is signalled.  NOTE 4: Does not apply for Band n41, CA configurations including Band n41, and EN-DC configurations that include n41 specified in subclause 5.2B of TS 38.101-3 [4] when NS\_04 is signalled. | | | |

##### 6.5H.1.3.2 Spurious emissions for UE co-existence for intra-band UL contiguous CA for UL MIMO

6.5H.1.3.2.1 Test purpose

To verify that UE transmitter does not cause unacceptable interference to co-existing systems for the specified bands which has specific requirements in terms of transmitter spurious emissions for 2UL CA.

6.5H.1.3.2.2 Test applicability

This test case applies to all types of NR UE release 15 and forward that support intra-band UL contiguous CA with UL MIMO.

6.5H.1.3.2.3 Minimum conformance requirements

The minimum conformance requirements are defined in subclause 6.5H.1.3.0.

6.5H1.3.2.4 Test description

Same test description as specified in clause 6.5A.3.2.1.4 for intra-band contiguous CA with following exceptions:

For initial conditions:

- Connect the SS to the UE antenna connectors as shown in TS 38.508-1 [5] Annex A, Figure A.3.1.1.6 for TE diagram and section A.3.2.3.11 for UE diagram.

For test procedures:

- Step 4 in 6.5A.3.1.1.4.2 is replaced by:

4. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0\_1 for C\_RNTI to schedule the UL RMC according to Table 6.5A.3.2.1.4.1-2 on both PCC and SCC. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC. The PDCCH DCI format 0\_1 is specified with the condition 2TX\_UL\_MIMO in 38.508-1 [5] subclause 4.3.6.1.1.2.

- Step 6 in 6.5A.3.1.1.4.2 is replaced by:

6. Measure the sum of power of the transmitted signal at each antenna connector with a measurement filter of bandwidths according to Table 6.5H.1.3.2.5-1. The centre frequency of the filter shall be stepped in contiguous steps according to Table 6.5H.1.3.2.5-1. The measured power shall be verified for each step. The measurement period shall capture the active time slots. During measurement the spectrum analyser shall be set to 'Detector' = RMS.

For message contents:

- Ensuring Table 4.6.3-182 configured with the condition 2TX\_UL\_MIMO

6.5H.1.3.2.5 Test requirement

For intra-band contiguous CA, the measured average power of spurious emission, derived in step 6, shall not exceed the described value in Tables 6.5H.1.3.2.5-1.

The requirements for the UE are release specific and can be found in Table 6.5H.1.3.2.5-1. If the UE support a CA configuration, which is not defined in the table corresponding UE’s release, the requirements for this CA configuration are taken from the table of earliest release where requirements for this CA configuration are defined.

Table 6.5H.1.3.2.5-0: Test Tolerance for uplink carrier aggregation

|  |  |  |
| --- | --- | --- |
|  | f ≤ 3.0GHz | 3.0GHz < f ≤ 6GHz |
| BW ≤ 40MHz | 0 | 0 |
| 40MHz < BW ≤ 100MHz | 0 | 0 |

Table 6.5H.1.3.2.5-1: Requirements for uplink intra-band contiguous carrier aggregation

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| NR CA combination | Release | Spurious emission | | | | | | |
| Protected Band | Frequency range (MHz) | | | Maximum Level (dBm) | MBW (MHz) | NOTE |
| CA\_n41 | Rel-16 | E-UTRA Band 1, 2, 3, 4, 5, 8, 12, 13, 14, 17, 24, 25, 26, 27, 28, 29, 30, 34, 39, 42, 44, 45, 48, 50, 51, 52, 65, 66, 70, 71, 73, 74, 85,  NR Band n77, n78 | FDL\_low | - | FDL\_high | -50 | 1 |  |
|  | NR Band n79 | FDL\_low | - | FDL\_high | -50 | 1 | 2, 4 |
|  | E-UTRA Band 9, 11, 18, 19, 21 | FDL\_low | - | FDL\_high | -50 | 1 | 6 |
|  | E-UTRA Band 40 | FDL\_low | - | FDL\_high | -40 | 1 |  |
|  | Frequency range | 1884.5 |  | 1915.7 | -41 | 0.3 | 5, 6 |
| Rel-17 | E-UTRA Band 1, 2, 3, 4, 5, 8, 12, 13, 14, 17, 24, 25, 26, 27, 28, 29, 30, 34, 39, 42, 44, 45, 48, 50, 51, 52, 65, 66, 70, 71, 73, 74, 85, 103  NR Band n77, n78, n100 | FDL\_low | - | FDL\_high | -50 | 1 |  |
|  | NR Band n79 | FDL\_low | - | FDL\_high | -50 | 1 | 2, 4 |
|  | E-UTRA Band 9, 11, 18, 19, 21 | FDL\_low | - | FDL\_high | -50 | 1 | 6 |
|  | E-UTRA Band 40 | FDL\_low | - | FDL\_high | -40 | 1 |  |
|  | Frequency range | 1884.5 |  | 1915.7 | -41 | 0.3 | 5, 6 |
|  | Rel-18 | E-UTRA Band 1, 2, 3, 4, 5, 8, 12, 13, 14, 17, 24, 25, 26, 27, 28, 29, 30, 34, 39, 42, 44, 45, 48, 50, 51, 52, 54, 65, 66, 70, 71, 73, 74, 85, 103  NR Band n77, n78, n100 | FDL\_low | - | FDL\_high | -50 | 1 |  |
|  |  | NR Band n79 | FDL\_low | - | FDL\_high | -50 | 1 | 2, 4 |
|  |  | E-UTRA Band 9, 11, 18, 19, 21 | FDL\_low | - | FDL\_high | -50 | 1 | 6 |
|  |  | E-UTRA Band 40 | FDL\_low | - | FDL\_high | -40 | 1 |  |
|  |  | Frequency range | 1884.5 |  | 1915.7 | -41 | 0.3 | 5, 6 |
| CA\_n78 | Rel-16 | E-UTRA Band 1, 3, 5, 7, 8, 11, 18, 19, 20, 21, 26, 28, 34, 39, 40, 41, 65 | FDL\_low | - | FDL\_high | -50 | 1 |  |
|  | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 5 |
| Rel-17 | E-UTRA Band 1, 3, 5, 7, 8, 11, 18, 19, 20, 21, 26, 28, 34, 39, 40, 41, 65, n100 | FDL\_low | - | FDL\_high | -50 | 1 |  |
|  | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 5 |
| NOTE 1: Void.  NOTE 2: Void.  NOTE 3: Void.  NOTE 4: As exceptions, measurements with a level up to the applicable requirements defined in Table 6.5.3.1-2 are permitted for each assigned NR carrier used in the measurement due to 2nd, 3rd, 4th or 5th harmonic spurious emissions. Due to spreading of the harmonic emission the exception is also allowed for the first 1 MHz frequency range immediately outside the harmonic emission on both sides of the harmonic emission. This results in an overall exception interval centred at the harmonic emission of (2 MHz + N x LCRB x RBsize kHz), where N is 2, 3, 4, 5 for the 2nd, 3rd, 4th or 5th harmonic respectively. The exception is allowed if the measurement bandwidth (MBW) totally or partially overlaps the overall exception interval.  NOTE 5: Applicable when co-existence with PHS system operating in 1884.5 - 1915.7 MHz.  NOTE 6: This requirement applies when the NR carrier is confined within 2545 – 2575 MHz or 2595 – 2645 MHz and the channel bandwidth is 10 or 20 MHz  NOTE 7: As exceptions, for 90 and 100 MHz aggregated bandwidth, -40 dBm/MHz is applicable in the frequency range of 2496 – 2505 MHz. | | | | | | | | |

##### 6.5H.1.3.3 Additional spurious emissions for intra-band UL contiguous CA for UL MIMO

Editor’s note: The following aspects are either missing or not yet determined:

- Tests for network signalling value other than NS\_04 are not complete.

6.5H.1.3.3.1 Test purpose

To verify that UE transmitter does not cause unacceptable interference to other channels or other systems in terms of transmitter spurious emissions under the deployment scenarios where additional requirements are specified.

6.5H.1.3.3.2 Test applicability

This test case applies for network signalling values CA\_NS\_04 to all types of NR UE release 15 and forward that support intra-band UL contiguous CA with UL MIMO.

6.5H.1.3.3.3 Minimum conformance requirements

The minimum conformance requirements are defined in subclause 6.5A.3.3.0.

6.5H.1.3.3.4 Test description

Same test description as specified in clause 6.5A.3.3.1.4 for intra-band contiguous CA with following exceptions:

For initial conditions:

- For CA\_NS\_04, same test configuration as listed in Table 6.2H.1.3.4.1-1 shall be used with only Test IDs 3~8 tested.

- Connect the SS to the UE antenna connectors as shown in TS 38.508-1 [5] Annex A, Figure A.3.1.1.6 for TE diagram and section A.3.2.3.11 for UE diagram.

- The UL Reference Measurement channels are set according to the test configuration tables in clause 6.2H.1.3.4.1.

For test procedures:

- Step 4 in 6.5A.3.3.1.4.2 is replaced by:

4. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0\_1 for C\_RNTI to schedule the UL RMC according to clause 6.2H.1.3.4.1 on both PCC and SCC as appropriate. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC. The PDCCH DCI format 0\_1 is specified with the condition 2TX\_UL\_MIMO in 38.508-1 [5] subclause 4.3.6.1.1.2.

- Step 6 and 7 in 6.5A.3.3.1.4.2 are replaced by:

6. Measure the sum of mean power from both antenna connectors and all component carriers in the CA configuration of the radio access mode, which shall meet the requirements described in clause 6.2H.1.3. The period of the measurement shall be at least the continuous duration of one active sub-frame (1ms) and in the uplink symbols. For TDD slots with transient periods are not under test. During measurement the spectrum analyser shall be set to 'Detector' = RMS.

7. Measure the sum of power of the transmitted signal at each antenna connector with a measurement filter of bandwidths according to Table 6.5H.1.3.3.5.1-1 and using a rms detector. The centre frequency of the filter shall be stepped in continuous steps according to the same table. The measured power shall be verified for each step. The measurement period shall capture the active time slots.

For message contents:

- Ensuring Table 4.6.3-182 configured with the condition 2TX\_UL\_MIMO

- For CA\_NS\_04, message contents exceptions in 6.2H.1.3.4.3 for Test IDs 3~8 apply.

6.5H.1.3.3.5 Test requirement

6.5H.1.3.3.5.1 Test requirements (network signalling value "CA\_NS\_04")

When "CA\_NS\_04" is indicated in the cell:

- the measured UE mean power in the channel bandwidth, derived in step 6, shall fulfil requirements in Table 6.2H.1.3.5-1 for UE power class 3 or Table 6.2H.1.3.5-2 for UE power class 2.

and

- the power of any UE emission derived in step 7 shall fulfil requirements in table 6.5H.1.3.3.5.1-1. This requirement also applies for the frequency ranges that are less than FOOB (MHz) in Table 6.5A.3.1-1 from the edge of the aggregated channel bandwidth.

Table 6.5H.1.3.3.5.1-1: Additional requirements for "CA\_ NS\_04"

|  |  |  |
| --- | --- | --- |
| Frequency range  (MHz) | BWChannel\_CA (MHz) / Spectrum emission limit (dBm) | Measurement bandwidth |
|  | 20 to 190 MHz |  |
| 2495 ≤ f < 2496 | -13 | Max(1 % of BWChannel\_CA, 1 MHz) |
| 2490.5 ≤ f < 2495 | -13 | 1 MHz |
| 0.009 < f < 2490.5 | -25 | 1 MHz |

#### 6.5H.1.4 Transmit intermodulation for intra-band UL contiguous CA for UL MIMO

6.5H.1.4.1 Test purpose

To verify that the UE transmit intermodulation does not exceed the described value in the test requirement.

The transmit intermodulation performance 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 wanted signal and an interfering signal reaching the transmitter via the antenna.

6.5H.1.4.2 Test applicability

This test case applies to all types of NR UE release 15 and forward that support intra-band UL contiguous CA with UL MIMO.

6.5H.1.4.3 Minimum conformance requirements

For UE supporting intra-band UL contiguous CA and UL MIMO, the transmit intermodulation requirements are specified at each transmit antenna connector and the wanted signal is defined as the sum of output powers from both UE transmit antenna connectors, the requirements specified in clause 6.5A.4.0 apply. The requirements shall be met with the UL MIMO configurations described in clause 6.2H.1.1.3.

If UE is scheduled for single antenna-port PUSCH transmission by DCI format 0\_0 or by DCI format 0\_1 for single antenna port codebook based transmission with precoding matrix *W*=1 [6.3.1.5 TS 38.211], the requirements in clause 6.5A.4.0 apply.

The normative reference for this requirement is TS 38.101-1 [2] clause 6.5H.1.4.

6.5H.1.4.4 Test description

Same test description as specified in clause 6.5A.4.1.4 for intra-band contiguous CA with following exceptions:

For initial conditions:

- Test configuration Table 6.5A.4.1.4.1-2 is replaced by Table 6.5H.1.4.4-1.

Table 6.5H.1.4.4-1: Intra-band CA Test Configuration Table

|  |  |  |  |
| --- | --- | --- | --- |
| Initial Conditions | | | |
| Test Environment as specified in TS 38.508-1 [5] subclause 4.1 | | Normal | |
| Test Frequencies as specified in TS 38.508-1 [5] subclause4.3.1.1.3 for inter band CA in FR1 | | Mid range for PCC and SCC | |
| Test Channel Bandwidths as specified in TS 38.508-1 [5] subclause 4.3.1 | | Lowest NRB\_agg for both PCC and SCC  Highest NRB\_agg for both PCC and SCC | |
| Test SCS as specified in Table 5.3.5-1 | | Lowest and highest supported SCS per Channel Bandwidth | |
| Test Parameters | | | |
| Test ID | Downlink Configuration | Uplink Configuration | |
| Modulation | RB allocation (NOTE 1) |
|  |
| 1 | CP-OFDM QPSK | Inner Full |
| NOTE 1: The specific configuration of each RB allocation is defined in Table 6.1A-1a.  NOTE 2: Test Channel Bandwidths and Test SCS are checked separately for each NR CA band combination, which applicable channel bandwidths is specified in Table 5.5A.1-1 and SCS is specified in Table 5.3.5-1 for each NR band. | | | |

- Connect the SS to the UE antenna connectors as shown in TS 38.508-1 [5] Annex A, Figure A.3.1.1.6 for TE diagram and section A.3.2.3.11 for UE diagram.

- The UL Reference Measurement channels are set according to the test configuration tables in clause 6.2H.1.4.4.1-1.

For test procedures:

- Step 4 in 6.5A.4.1.4.2 is replaced by:

4. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0\_1 for C\_RNTI to schedule the UL RMC according to Table 6.5H.1.4.4.1-1 on both PCC and SCC. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC. The PDCCH DCI format 0\_1 is specified with the condition 2TX\_UL\_MIMO in 38.508-1 [5] subclause 4.3.6.1.1.2.

- Step 6 in 6.5A.4.1.4.2 is replaced by:

6. Measure the sum of rectangular filtered mean power from both antenna connectors of the UE. For TDD slots with transient periods are not under test for the wanted signal and for the intermodulation product.

- For step 9 and step 11, the measurement of transmitting intermodulation is the sum of rectangular filtered mean power from both antenna connectors.

For message contents:

- Ensuring Table 4.6.3-182 configured with the condition 2TX\_UL\_MIMO.

Table 6.5H.1.4.4-2: FrequencyInfoUL-SIB for intra-band contiguous CA (contiguous RB allocation) for CA\_n41C

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [5] Table 4.6.3-62 FrequencyInfoUL-SIB | | | |
| Information Element | Value/remark | Comment | Condition |
| p-Max | 16 |  | Power class 3 |
|  | 19 |  | Power class 2 |

6.5H.1.4.5 Test requirement

Intra-band CA: The ratio derived in steps 9, 11, shall not exceed the described value in Table 6.5H.1.4.5-1.

Table 6.5H.1.4.5-1: Transmit Intermodulation for intra-band CA

|  |  |  |  |
| --- | --- | --- | --- |
| CA bandwidth class(UL) | B and C | | |
| Interference Signal  Frequency Offset | BWChannel\_CA | 2\*BWChannel\_CA | |
| Interference CW Signal Level | -40dBc | | |
| Intermodulation Product | -29dBc | -35dBc | |
| Measurement bandwidth  (NOTE1) | Nominal channel space+MBWACLR,low/2+ MBWACLR,high/2 | | |
| Measurement offset from channel centre | BWChannel\_CA and 2\*BWChannel\_CA | | 2\*BWChannel\_CA and 4\*BWChannel\_CA |
| NOTE 1: MBWACLR,low and MBWACLR,high are the single-channel ACLR measurement bandwidths specified for channel bandwidths BWchannel(low) and BWchannel(high) in 6.5.2.4.1.5-1, respectively. | | | |

Table 6.5H.1.4.5-2: Test Tolerance for Transmit Intermodulation

|  |  |  |
| --- | --- | --- |
|  | f ≤ 3.0GHz | 3.0GHz < f ≤ 6GHz |
| BW ≤ 40MHz | 0dB | 0dB |
| 40MHz < BW ≤ 100MHz | 0dB | 0dB |

## 6.5J Output RF spectrum emissions for ATG

### 6.5J.0 General

Unwanted emissions are divided into "Out-of-band emission" and "Spurious emissions" in 3GPP RF specifications. This notation is in line with ITU-R recommendations such as SM.329-10 and the Radio Regulations ‎[22].

ITU defines:

Out-of-band emission = Emission on a frequency or frequencies immediately outside the necessary bandwidth which results from the modulation process but excluding spurious emissions.

Spurious emission = Emission on a frequency, or frequencies, which are outside the necessary bandwidth and the level of which may be reduced without affecting the corresponding transmission of information. Spurious emissions include harmonic emissions, parasitic emissions, intermodulation products and frequency conversion products but exclude out-of-band emissions.

Unwanted emissions = Consist of spurious emissions and out-of-band emissions.

The UE transmitter spectrum emission consists of the three components: the occupied bandwidth (channel bandwidth), the Out Of Band (OOB) emissions and the far out spurious emission domain.



Figure 6.5J.0-1: Transmitter RF spectrum

### 6.5J.1 Occupied bandwidth for ATG

Editor’s Note: This test is incomplete. The following aspects are not yet determined:

- Annex F MU/TT is FFS.

- Message contents are TBC pending on Rel-18 ASN.1 freeze.

6.5J.1.1 Test purpose

To verify that the NR ATG UE occupied bandwidth for all transmission bandwidth configurations supported by the ATG UE are less than their specific limits.

6.5J.1.2 Test applicability

This test case applies to all types of NR ATG UE release 18 and forward.

6.5J.1.3 Minimum conformance requirements

Occupied bandwidth is defined as the bandwidth containing 99 % of the total integrated mean power of the transmitted spectrum on the assigned channel. The occupied bandwidth for all transmission bandwidth configurations (Resources Blocks) shall be less than the channel bandwidth specified in Table 6.5J.1.3-1.

Table 6.5J.1.3-1: Occupied channel bandwidth

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | NR channel bandwidth | | | | | | | | | | | | | | |
|  | 5 MHz | 10 MHz | 15 MHz | 20 MHz | 25 MHz | 30 MHz | 35 MHz | 40 MHz | 45 MHz | 50 MHz | 60 MHz | 70 MHz | 80 MHz | 90 MHz | 100 MHz |
| Occupied channel bandwidth (MHz) | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 | 60 | 70 | 80 | 90 | 100 |

The normative reference for this requirement is TS 38.101-1 [2] clause 6.5J.1.

6.5J.1.4 Test description

6.5J.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, test channel bandwidths and sub-carrier spacing based on NR operating bands specified in table 5.3.5-1 that are restricted to the ATG UE. All of these configurations shall be tested with applicable test parameters for each combination of channel bandwidth and sub-carrier spacing, are shown in table 6.5J.1.4.1-1. The details of the uplink reference measurement channels (RMCs) are specified in Annexes A.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Table 6.5J.1.4.1-1: Test Configuration Table

|  |  |  |  |
| --- | --- | --- | --- |
| Initial Conditions | | | |
| Test Environment as specified in TS 38.508-1 [5] subclause 4.1 | | Normal | |
| Test Frequencies as specified in TS 38.508-1 [5] subclause 4.3.1 | | Mid range by default, exceptions listed in Table 6.5J.1.4.1-2 | |
| Test Channel Bandwidths as specified in TS 38.508-1 [5] subclause 4.3.1 | | All | |
| Test SCS as specified in Table 5.3.5-1 | | Lowest | |
| Test Parameters | | | |
| Test ID | Downlink Configuration | Uplink Configuration | |
|  | N/A for occupied bandwidth test case | Modulation | RB allocation (NOTE 1) |
| 1 | CP-OFDM QPSK | Outer\_full |
| NOTE 1: The specific configuration of each RB allocation is defined in Table 6.1-1. | | | |

Table 6.5J.1.4.1-2: Test frequency exceptions for Occupied Bandwidth

|  |  |
| --- | --- |
| 5G NR Band | Test Frequency |
| n78 | Low Range, Mid Range, High Range |
| n79 | Low Range, Mid Range, High Range |

1. Connect the SS to the UE antenna connectors as shown in TS 38.508-1 [5] Annex A, Figure A.3.1.1.1 for TE diagram and section A.3.2 for UE diagram.

2. The parameter settings for the cell are set up according to TS 38.508-1 [5] subclause 4.4.3.

3. Downlink signals are initially set up according to Annex C.0, C.1, C.2, and uplink signals according to Annex G.0, G.1, G.2, G.3.0.

4. The UL Reference Measurement channels are set according to Table 6.5J.1.4.1-1.

5. Propagation conditions are set according to Annex B.0 -

6. Ensure the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On,* Test Mode *On* and Test Loop Function *On* according to TS 38.508-1 [5] clause 4.5. Message contents are defined in clause 6.5J.1.4.3

6.5J.1.4.2 Test procedure

1. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0\_1 for C\_RNTI to schedule the UL RMC according to Table 6.5J.1.4.1-1. Since the UL has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC.

2. Send continuously power control “up” commands to the UE until the UE transmits at PUMAX level. Allow at least 200ms for the UE to reach PUMAX level.

3. Measure the power spectrum distribution as the sum of the powers from all the UE transmit antenna connectors within two times or more range over the requirement for Occupied Bandwidth specification centring on the current carrier frequency. The characteristics of the filter shall be approximately Gaussian (typical spectrum analyser filter). Other methods to measure the power spectrum distribution are allowed. The measuring duration is at least 1ms over consecutive active uplink slots. For TDD, only slots consisting of only UL symbols are under test.

4. Calculate the total power within the range of all frequencies measured in step 3 and save this value as “Total power”.

5. Identify the measurement window whose centre is aligned on the centre of the channel for which the sum of the power measured is 99% of the “Total power”.

6. The “Occupied Bandwidth” is the width of the measurement window obtained in step 5.

6.5J.1.4.3 Message contents

FFS

6.5J.1.5 Test requirement

The measured Occupied Bandwidth shall not exceed values in Table 6.5J.1.5-1.

Table 6.5J.1.5-1: Occupied channel bandwidth

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | NR channel bandwidth | | | | | | | | | | | | | | |
|  | 5 MHz | 10 MHz | 15 MHz | 20 MHz | 25 MHz | 30 MHz | 35 MHz | 40 MHz | 45 MHz | 50 MHz | 60 MHz | 70 MHz | 80 MHz | 90 MHz | 100 MHz |
| Occupied channel bandwidth (MHz) | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 | 60 | 70 | 80 | 90 | 100 |

### 6.5J.2 Out of band emission for ATG

#### 6.5J.2.1 General

The Out of band emissions are unwanted emissions immediately outside the assigned channel bandwidth resulting from the modulation process and non-linearity in the transmitter but excluding spurious emissions. This out of band emission limit is specified in terms of a spectrum emission mask and an adjacent channel leakage power ratio.

To improve measurement accuracy, sensitivity and efficiency, the resolution bandwidth may be smaller than the measurement bandwidth. When the resolution bandwidth is smaller than the measurement bandwidth, the result should be integrated over the measurement bandwidth in order to obtain the equivalent noise bandwidth of the measurement bandwidth.

### 6.5J.3 Spurious emissions for ATG

#### 6.5J.3.0 General

Spurious emissions are emissions which are caused by unwanted transmitter effects such as harmonics emission, parasitic emissions, intermodulation products and frequency conversion products, but exclude out of band emissions unless otherwise stated. The spurious emission limits are specified in terms of general requirements in line with SM.329 [22] and NR operating band requirement to address UE co-existence.

To improve measurement accuracy, sensitivity and efficiency, the resolution bandwidth may be smaller than the measurement bandwidth. When the resolution bandwidth is smaller than the measurement bandwidth, the result should be integrated over the measurement bandwidth in order to obtain the equivalent noise bandwidth of the measurement bandwidth.

NOTE: For measurement conditions at the edge of each frequency range, the lowest frequency of the measurement position in each frequency range should be set at the lowest boundary of the frequency range plus MBW/2. The highest frequency of the measurement position in each frequency range should be set at the highest boundary of the frequency range minus MBW/2. MBW denotes the measurement bandwidth defined for the protected band.

#### 6.5J.3.1 General spurious emissions for ATG

Editor’s Note: This test is incomplete. The following aspects are not yet determined:

- Annex F MU/TT is FFS.

- Message contents are TBC pending on Rel-18 ASN.1 freeze.

6.5.3J.1.1 Test purpose

To verify that NR ATG UE transmitter does not cause unacceptable interference to other channels or other systems in terms of transmitter spurious emissions.

6.5.3J.1.2 Test applicability

This test case applies to all types of NR ATG UE release 18 and forward.

6.5.3J.1.3 Minimum conformance requirements

For ATG UE, the minimum conformance requirements shall be the same as in clause 6.5.3.1.3.

The normative reference for this requirement is TS 38.101-1 [2] subclause 6.5J.3

6.5.3J.1.4 Test description

6.5.3J.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, test channel bandwidths and sub-carrier spacing based on NR operating bands specified in Table 5.3.5-1. All of these configurations shall be tested with applicable test parameters for each combination of channel bandwidth and sub-carrier spacing, are shown in Table 6.5.3J.1.4.1-1. The details of the uplink reference measurement channels (RMCs) are specified in Annexes A.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Table 6.5.3J.1.4.1-1: Test Configuration Table

|  |  |  |  |
| --- | --- | --- | --- |
| Initial Conditions | | | |
| Test Environment as specified in TS 38.508-1 [5] subclause 4.1. | | Normal | |
| Test Frequencies as specified in TS 38.508-1 [5] subclause 4.3.1. | | Low range, Mid range, High range | |
| Test Channel Bandwidths as specified in TS 38.508-1 [5] subclause 4.3.1. | | Lowest, Mid, Highest | |
| Test SCS as specified in Table 5.3.5-1 | | Lowest | |
| Test Parameters | | | |
| Test ID | Downlink Configuration | Uplink Configuration | |
|  | N/A for Spurious Emissions testing | Modulation | RB allocation (NOTE 1) |
| 1 | CP-OFDM QPSK | OuterFull |
| 2 | CP-OFDM QPSK | Edge\_1RB\_Left |
| 3 | CP-OFDM QPSK | Edge\_1RB\_Right |
| NOTE 1: The specific configuration of each RB allocation is defined in Table 6.1-1 Common UL configuration. | | | |

1. Connect the SS to the UE antenna connectors as shown in TS 38.508-1 [5] Annex A, Figure A.3.1.1.1 for TE diagram and section A.3.2 for UE diagram.

2. The parameter settings for the cell are set up according to TS 38.508-1 [5] subclause 4.4.3.

3. Downlink signals are initially set up according to Annex C.0, C.1 and C.2, and uplink signals according to Annex G.0, G.1, G.2, G.3.0.

4. The UL Reference Measurement channels are set according to Table 6.5.3J.1.4.1-1.

5. Propagation conditions are set according to Annex B.0.

6. Ensure the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On,* Test Mode *On* and Test Loop Function *On* according to TS 38.508-1 [5] clause 4.5. Message contents are defined in clause 6.5.3J.1.4.3 with no exceptions.

6.5.3J.1.4.2 Test procedure

1. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0\_1 for C\_RNTI to schedule the UL RMC according to Table 6.5.3J.1.4.1-1. Since the UE has no payload data to send, the UE transmits uplink MAC padding bits on the UL RMC.

2. Send continuously uplink power control "up" commands in the uplink scheduling information to the UE until the UE transmits at PUMAX level.

3. Measure the power of the transmitted signal at each antenna connector with a measurement filter of bandwidths according to Table 6.5.3J.1.5-1. The centre frequency of the filter shall be stepped in contiguous steps according to Table 6.5.3J.1.5-1. The measured power shall be verified for each step. The measurement period shall capture the active time slots. During measurement the spectrum analyser shall be set to 'Detector' = RMS.

6.5.3J.1.4.3 Message contents

FFS

6.5.3J.1.5 Test requirement

This clause specifies the requirements for the specified NR band for Transmitter Spurious emissions requirement with frequency range as indicated in Table 6.5.3J.1.5-1.

Unless otherwise stated, the spurious emission limits apply for the frequency ranges that are more than FOOB (MHz) in Table 6.5.3J.1.3-1 from the edge of the channel bandwidth. The spurious emission limits in Table 6.5.3J.1.5-1 apply for all transmitter band configurations (NRB) and channel bandwidths.

The measured average power of spurious emission, derived in step 3, shall not exceed the described value in Table 6.5.3J.1.5-1.

Table 6.5.3J.1.5-1: General spurious emissions test requirements for ATG UG

|  |  |  |  |
| --- | --- | --- | --- |
| Frequency Range | Maximum Level | Measurement bandwidth | NOTE |
| 9 kHz ≤ f < 150 kHz | -36 dBm | 1 kHz |  |
| 150 kHz ≤ f < 30 MHz | -36 dBm | 10 kHz |  |
| 30 MHz ≤ f < 1000 MHz | -36 dBm | 100 kHz |  |
| 1 GHz ≤ f < 12.75 GHz | -30 dBm | 1 MHz | 2 |
| 12.75 GHz ≤ f < 5th harmonic of the upper frequency edge of the UL operating band in GHz | -30 dBm | 1 MHz | 1 |
| NOTE 1: Applies for Band for which the upper frequency edge of the UL Band is greater than 2.55 GHz and less than or equal to 5.2 GHz  NOTE 2: Does not apply for Band n41, CA configurations including Band n41, and EN-DC configurations that include n41 specified in subclause 5.2B of TS 38.101-3 [4] when NS\_04 is signalled. | | | |