**3GPP TSG-RAN4 Meeting #94-eR4-2002786**

**Online, 24th Feb. – 06th March, 2020**

|  |
| --- |
| *CR-Form-v12.0* |
| **CHANGE REQUEST** |
|  |
|  | **38.101-3** | **CR** | **xxx** | **rev** | **-**  | **Current version:** | **16.2.1** |  |
|  |
| *For* [***HE******LP***](http://www.3gpp.org/3G_Specs/CRs.htm#_blank)*on using this form: comprehensive instructions can be found at* [*http://www.3gpp.org/Change-Requests*](http://www.3gpp.org/Change-Requests)*.* |
|  |

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| ***Proposed change affects:*** | UICC apps |  | ME | **x** | Radio Access Network |  | Core Network |  |

|  |
| --- |
|  |
| ***Title:***  | CR on single SL transmission by TDM operation between NR SL and LTE SL at ITS spectrum in TS38.101-3 in rel-16 |
|  |  |
| ***Source to WG:*** | LG Electronics, [Huawei, CATT] |
| ***Source to TSG:*** | R4 |
|  |  |
| ***Work item code:*** | 5G\_V2X\_NRSL-Core |  | ***Date:*** | 2020-03-02 |
|  |  |  |  |  |
| ***Category:*** | B |  | ***Release:*** | Rel-16 |
|  | *Use one of the following categories:****F*** *(correction)****A*** *(mirror corresponding to a change in an earlier release)****B*** *(addition of feature),* ***C*** *(functional modification of feature)****D*** *(editorial modification)*Detailed explanations of the above categories canbe found in 3GPP [TR 21.900](http://www.3gpp.org/ftp/Specs/html-info/21900.htm). | *Use one of the following releases:Rel-8 (Release 8)Rel-9 (Release 9)Rel-10 (Release 10)Rel-11 (Release 11)Rel-12 (Release 12)**Rel-13 (Release 13)Rel-14 (Release 14)Rel-15 (Release 15)Rel-16 (Release 16)* |
|  |  |
| ***Reason for change:*** | This CR is included EN-V2X operating bands and ON/OFF TIME mask for NR V2X TDM operation between NR V2X and LTE V2X transmission at ITS spectrum in TS38.101-3 in rel-16. |
|  |  |
| ***Summary of change:*** | * Add suffix E for EN-V2X operation in 4.3 and include EN-V2X operating bands and channel bandwidths
* Specified EN-V2X UE Tx/Rx requirements
* Specially, define ON/OFF time mask for EN-V2X TDM operation at n47 without dual PA mode
* When a NR V2X UE is operated with TDM between NR SL and LTE SL at n47 without dual PA capability, the maximum UL switching time is defined as [120] us and SL reception interruption is allowed during UL switching time masks.
 |
|  |  |
| ***Consequences if not approved:*** | Not support the TDM operation between NR SL and LTE SL transmission for NR V2X UE without dual PA. |
|  |  |
| ***Clauses affected:*** | 3.3, 4.3, 5.2E, 5.3E, 5.4E, 5.5E, 6.2E, 6.3E, 6.4E, 6.5E, 7.3E, 7.4E, 7.5E, 7.6E, 7.7E, 7.8E |
|  |  |
|  | **Y** | **N** |  |  |
| ***Other specs*** |  |  |  Other core specifications  | TS/TR ... CR ...  |
| ***affected:*** | **x** |  |  Test specifications | 38.521-3  |
| ***(show related CRs)*** |  |  |  O&M Specifications | TS/TR ... CR ...  |
|  |  |
| ***Other comments:*** |  |
|  |  |
| ***This CR's revision history:*** |  |

## *<< Start of changes >>*

## 3.3 Abbreviations

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

ACLR Adjacent Channel Leakage Ratio

ACS Adjacent Channel Selectivity

A-MPR Additional Maximum Power Reduction

BCS Bandwidth Combination Set

CA Carrier Aggregation

CC Component Carrier

DC Dual Connectivity

EIRP Equivalent Isotropically Radiated Power

EN-DC E-UTRA/NR DC

EVM Error Vector Magnitude

FDM Frequency Division Multiplexing

FR Frequency Range

ENBW The aggregated bandwidth of an E-UTRA sub-block and an adjacent NR sub-block

ITS Intelligent Transportation System

ITU-R Radiocommunication Sector of the International Telecommunication Union

MBW Measurement bandwidth defined for the protected band

MPR Allowed maximum power reduction

MSD Maximum Sensitivity Degradation

MCG Master Cell Group

NR New Radio

NS Network Signalling

NSA Non-Standalone, a mode of operation where operation of an other radio is assisted with an other radio

OOB Out-of-band

OOBE Out-of-band emission

OTA Over The Air

PRB Physical Resource Block

PSCCH Physical Sidelink Control CHannel

PSSCH Physical Sidelink Shared CHannel

RE Resource Element

REFSENS Reference Sensitivity

RF Radio Frequency

Rx Receiver

SCG Secondary Cell Group

SCS Subcarrier spacing

SEM Spectrum Emission Mask

SL Sidelink

SUL Supplementary uplink

TDM Time Division Multiplex

Tx Transmitter

UE User Equipment

UL MIMO Up Link Multiple Antenna transmission

ULSUP Uplink sharing from UE perspective

V2X Vehicle to Everything

# 4 General

## 4.1 Relationship between minimum requirements and test requirements

The present document is interwork specification for NR UE, covering RF characteristics and minimum performance requirements. Conformance to the present specification is demonstrated by fulfilling the test requirements specified in the conformance specification 3GPP TS 38.521-3 [5].

The Minimum Requirements given in this specification make no allowance for measurement uncertainty. The test specification TS 38.521-3 [5] defines test tolerances. These test tolerances are individually calculated for each test. The test tolerances are used to relax the minimum requirements in this specification to create test requirements. For some requirements, including regulatory requirements, the test tolerance is set to zero.

The measurement results returned by the test system are compared - without any modification - against the test requirements as defined by the shared risk principle.

The shared risk principle is defined in Recommendation ITU‑R M.1545 [6].

## 4.2 Applicability of minimum requirements

a) In this specification the Minimum Requirements are specified as general requirements and additional requirements. Where the Requirement is specified as a general requirement, the requirement is mandated to be met in all scenarios

b) For specific scenarios for which an additional requirement is specified, in addition to meeting the general requirement, the UE is mandated to meet the additional requirements.

c) The spurious emissions power requirements are for the long-term average of the power. For the purpose of reducing measurement uncertainty it is acceptable to average the measured power over a period of time sufficient to reduce the uncertainty due to the statistical nature of the signal

d) Terminal that supports EN-DC configuration shall meet E-UTRA requirements as specified in TS 36.101 [4] and NR requirements as in TS 38.101-1 [2] and TS 38.101-2 [3] unless otherwise specified in this specification

e) All the requirements for intra-band contiguous and non-contiguous EN-DC apply under the assumption of the same uplink-downlink and special subframe configurations in the E-UTRA and slot format indicated by UL-DL-configurationCommon and UL-DL-configurationDedicated in the NR for the EN-DC.

f) For EN-DC combinations with CA configurations for E-UTRA and/or NR, all the requirements for E-UTRA and/or NR all the requirements for E-UTRA and/or NR intra-band contiguous and non-contiguous CA apply under the assumption of the same slot format indicated by UL-DL-configurationCommon and UL-DL-configurationDedicated in the PSCell and SCells for NR and the same uplink-downlink and special subframe configurations in Pcell and SCells for E-UTRA.

A terminal which supports an EN-DC configuration shall support:

If any subsets of the EN-DC configuration do not specify its own bandwidth combination sets in 5.3B, then the terminal shall support the same E-UTRA bandwidth combination sets it signals the support for in E-UTRA CA configuration part of E-UTRA – NR DC and shall support the same NR bandwidth combination sets it signals the support for in NR CA configuration part of E-UTRA – NR DC.

Else if one of the subsets of the EN-DC configuration specify its own bandwidth combination sets in 5.3B, then the terminal shall support a product set of channel bandwidth for each band specified by E-UTRA bandwidth combination sets, NR bandwidth combination sets, and EN-DC bandwidth combination sets it singnals the support.A terminal which supports an inter-band EN-DC configuration with a certain UL configuration shall support the all lower order DL configurations of the lower order EN-DC combinations, which have this certain UL configuration and the fallbacks of this UL configuration.

A terminal which supports CA or DC configurations, which include FR2 intra-band CA combinations with multiple subblocks, where at least one of the subblocks consists of a contiguous CA combination, is not required to support all possible fallback combinations but can directly fall back to a single FR2 carrier. Deactivating carriers within the CA or DC combination is still possible.

Terminal that supports inter-band NR-DC between FR1 and FR2 configuration shall meet the requirements for corresponding CA configuration (suffix A), unless otherwise specified.

## 4.3 Specification suffix information

Unless stated otherwise the following suffixes are used for indicating at 2nd level clause, shown in Table 4.3-1.

Table 4.3-1: Definition of suffixes

|  |  |
| --- | --- |
| Clause suffix | Variant |
| None | Single Carrier |
| A | Carrier Aggregation (CA) between FR1 and FR2 |
| B | Dual-Connectivity (DC) with and without SUL including UL sharing from UE perspective, inter-band NR DC between FR1 and FR2 |
| D | UL MIMO |
| E | NR V2X |

# 5 Operating bands and channel arrangement

## 5.1 General

The channel arrangements presented in this clause are based on the operating bands and channel bandwidths defined in the present release of specifications.

NOTE: Other operating bands and channel bandwidths may be considered in future releases.

Requirements throughout the RF specifications are in many cases defined separately for different frequency ranges (FR). The frequency ranges in which NR can operate according to this version of the specifications are identified as described in Table 5.1-1.

Table 5.1-1: Definition of frequency ranges

|  |  |
| --- | --- |
| Frequency range designation | Corresponding frequency range |
| FR1 | 410 MHz – 7125 MHz |
| FR2 | 24250 MHz – 52600 MHz |

The present specification covers band combinations including

- at least one FR1 operating band and one FR2 operating band for carrier aggregation and dual connectivity operations;

- at least one E-UTRA operating band for dual connectivity operations.

## 5.2 Operating bands

NR is designed to operate in FR1 operating bands defined in TS 38.101-1 [2] and FR2 operating bands defined in TS 38.101-2 [3]. E-UTRA is designed to operate in operating bands defined in TS 36.101 [4].

## 5.2A Operating bands for CA

### 5.2A.1 Inter-band CA between FR1 and FR2

NR carrier aggregation is designed to operate in the operating bands defined in Table 5.2A.1‑1 and Table 5.2A.1-2. The band combinations include at least one FR1 operating band and one FR2 operating band.

Operating bands for CA including Band n90 are defined by the corresponding operating bands for CA including Band n41 with Band n90 replacing Band n41. For brevity the said operating bands for CA including Band n90 are not listed in the tables below but are covered by this specification.

Table 5.2A.1-1: Band combinations for inter-band CA between FR1 and FR2 (two bands)

|  |  |
| --- | --- |
| NR CA Band | NR Band |
| CA\_n1-n2571 | n1, n257 |
| CA\_n3-n2571 | n3, n257 |
| CA\_n5-n2601 | n5, n260 |
| CA\_n5-n2611 | n5, n261 |
| CA\_n8-n258 | n8, n258 |
| CA\_n25-n2601 | n25, n260 |
| CA\_n25-n2611 | n25, n261 |
| CA\_n28-n2571 | n28, n257 |
| CA\_n41-n2601 | n41, n260 |
| CA\_n41-n2611 | n41, n261 |
| CA\_n66-n260 | n66, n260 |
| CA\_n66-n261 | n66, n261 |
| CA\_n71-n2571 | n71, n257 |
| CA\_n71-n2601 | n71, n260 |
| CA\_n71-n2611 | n71, n261 |
| CA\_n77-n2571 | n77, n257 |
| CA\_n77-n2581 | n77, n258 |
| CA\_n77-n2611 | n77, n261 |
| CA\_n78-n2571 | n78, n257 |
| CA\_n78-n2581 | n78, n258 |
| CA\_n79-n2571 | n79, n257 |
| CA\_n79-n2581 | n79, n258 |
| NOTE 1: Applicable for UE supporting inter-band carrier aggregation with mandatory simultaneous Rx/Tx capability. |

Table 5.2A.1-2: Band combinations for inter-band CA between FR1 and FR2 (three bands)

|  |  |
| --- | --- |
| NR CA Band | NR Band |
| CA\_n3-n28-n257 | n3, n28, n257 |
| CA\_n3-n77-n257 | n3, n77, n257 |
| CA\_n3-n78-n257 | n3, n78, n257 |
| CA\_n28-n77-n257 | n28, n77, n257 |
| CA\_n28-n78-n257 | n28, n78, n257 |
| CA\_n77-n79-n257 | n77, n79, n257 |
| CA\_n78-n79-n257 | n78, n79, n257 |

Table 5.2A.1-3: Band combinations for inter-band CA between FR1 and FR2 (four bands)

|  |  |
| --- | --- |
| NR CA Band | NR Band |
| CA\_n3-n28-n77-n257 | n3, n28, n77, n257 |
| CA\_n3-n28-n78-n257 | n3, n28, n78, n257 |

### *<< Unchanged sections are omitted >>*

## 5.2E Operating bands for EN-V2X operation

### 5.2E.1 EN-V2X in FR1

The E-UTRA-NR V2X operating bands combinations are specified in Table 5.2E.1-1.

Table 5.2E.1-1: EN-V2X Band combinations in FR1 (two bands)

|  |  |  |
| --- | --- | --- |
| E-UTRA-NR V2X Band Combination | E-UTRA Band | NR Band |
| EN-V2X\_47\_n471 | 47 | n47 |
| NOTE 1: EN-V2X UE only allow single SL transmission between Band 47 and NR band n47 |

## 5.3 UE Channel bandwidth

## 5.3A UE Channel bandwidth for CA

### 5.3A.1 Inter-band CA between FR1 and FR2

For inter-band NR CA between FR1 and FR2, a carrier aggregation configuration is a combination of operating bands, each supporting a carrier aggregation bandwidth class as specified in clause 5.3A.5 of TS 38.101-1 [2] and clause 5.3A.4 of TS 38.101-2 [3] independently.

### *<< Unchanged sections are omitted >>*

## 5.3E UE Channel bandwidth for EN-V2X

The requirements specified in clause 5.3B are applicable to E-UTRA-NR V2X UE.

### 5.3E.1 Intra-band contiguous EN-V2X in FR1

For intra-band contiguous E-UTRA NR V2X UE, an EN-DC bandwidth class in Table 5.3.B-1 are considered to specify the EN-V2X transmission/reception configurations.

Bandwidth combination sets and EN-V2X transmission/reception configurations for intra-band contiguous EN-V2X UE are specified in Table 5.3E.1-1.

Table 5.3E.1-1: E-UTRA-NR V2X configurations and bandwidth combination sets for intra-band contiguous EN-V2X UE

| E-UTRA – NR configuration / Bandwidth combination set |
| --- |
| SL receptionEN-V2X configuration | SL transmisison band | Component carriers in order of increasing carrier frequency | Maximum aggregated bandwidth (MHz) | Bandwidth combination set |
| Channel bandwidths for E-UTRA carrier (MHz) | Channel bandwidths for NR carrier (MHz) | Channel bandwidths for E-UTRA carrier (MHz) |
| EN\_V2X\_(n)47AA | E-UTRA Band 47 or NR band n47 | 10 | 10,20,30,40 |  | 60 | 0 |
| 20 | 10,20,30,40 |  |
|  | 10,20,30,40 | 10 |
|  | 10,20,30,40 | 20 |
| NOTE 1: The EN-V2X UE only allow single SL transmission between Band 47 and NR band n47. |

### 5.3E.2 Intra-band non-contiguous E-UTRA NR V2X in FR1

For intra-band non-contiguous E-UTRA NR V2X UE, an EN-DC bandwidth class in Table 5.3.B-1 are considered to specify the EN-V2X transmission/reception configurations.

Bandwidth combination sets and SL transmission/reception configurations for intra-band non-contiguous EN-V2X are specified in Table 5.3E.2-1.

Table 5.3E.2-1: E-UTRA-NR V2X configurations and bandwidth combination sets for intra-band non-contiguous EN-V2X UE

|  |
| --- |
| E-UTRA – NR configuration / Bandwidth combination set |
| SL receptionEN-V2X configuration | SL transmisison band | Component carriers in order of increasing carrier frequency | Maximum aggregated bandwidth (MHz) | Bandwidth combination set |
| Channel bandwidths for E-UTRA carrier (MHz) | Channel bandwidths for NR carrier (MHz) | Channel bandwidths for E-UTRA carrier (MHz) |
| EN\_V2X\_47A\_n47A | E-UTRA Band 47 or NR band n47 | 10 | 10,20,30,40 |  | 60 | 0 |
| 20 | 10,20,30,40 |  |
|  | 10,20,30,40 | 10 |
|  | 10,20,30,40 | 20 |
| NOTE 1: The EN-V2X UE only allow single SL transmission between Band 47 and NR band n47. |

## 5.4 Void

## 5.4A Channel arrangement for CA

The channel arrangement for CA operations in FR1 and FR2 as specified in TS 38.101-1 [2] and TS 38.101-2 [3], respectively.

## 5.4B Channel arrangement for DC

The channel arrangement for intra-band EN-DC operations in FR1 is specified in TS 36.101 [4] and TS 38.101-1 [2] , respectively.

### 5.4B.1 Channel spacing for intra-band EN-DC carriers

The spacing between carriers will depend on the deployment scenario, the size of the frequency block available and the channel bandwidths. The nominal channel spacing between and E-UTRA carrier and an adjacent NR carrier for intra-band contiguous EN-DC is defined as following:

- For NR operating bands with 100 kHz channel raster,

Nominal Channel spacing = (BWE-UTRA\_Channel + BWNR\_Channel)/2

- For NR operating bands with 15 kHz channel raster,

 Nominal Channel spacing = (BWE-UTRA\_Channel + BWNR\_Channel)/2+{-5kHz, 0kHz, 5kHz}

- For NR operating bands with 30 kHz channel raster,

Nominal Channel spacing = (BWE-UTRA\_Channel + BWNR\_Channel)/2+{-5kHz, 0kHz, 5kHz} for ∆FRaster equals to 15 kHz

Nominal Channel spacing = (BWE-UTRA\_Channel + BWNR\_Channel)/2+{-10 kHz, 0 kHz, 10 kHz} for ∆FRaster equals to 30 kHz

where BWE-UTRA\_Channel and BWNR\_Channel are the channel bandwidths of the E-UTRA and NR carriers, ∆FRaster is the band dependent channel raster granularity defined in TS38.101-1[2]. The channel spacing can be adjusted depending on the channel raster to optimize performance in a particular deployment scenario.

For intra-band non-contiguous EN-DC the channel spacing between E-UTRA and NR carriers shall be larger than the nominal channel spacing defined in this clause.

### *<< Unchanged sections are omitted >>*

## 5.4E Channel arrangement for EN-V2X operation in FR1

The channel arrangement for intra-band EN-V2X operations in FR1 is specified in TS 36.101 [4] and TS 38.101-1 [2] , respectively.

### 5.4E.1 Channel spacing

For intra-band contiguous or non-contiguous EN-V2X operation with two or more component carriers, the each nominal channel spacing of E-UTRA V2X carrier or NR V2X carrier is applied, respectively

### 5.4E.2 Channel raster

For intra-band contiguous or non-contiguous EN-V2X operation with two or more component carriers, the each channel raster of E-UTRA V2X carrier or NR V2X carrier is applied, respectively.

## 5.5 Configuration

## 5.5A Configuration for CA

#### 5.5A.1 Inter-band CA configurations between FR1 and FR2

The configurations for operating bands for CA including Band n41 also apply for the corresponding operating bands for CA with Band n90 replacing Band n41 but with otherwise identical parameters. For brevity the said configuration for operating bands for CA with Band n90 are not listed in the tables below but are covered by this specification.

### *<< Unchanged sections are omitted >>*

## 5.5E Configuration for EN-V2X operation

### 5.5E.1 General

The operating bands and bandwidth classes are specified for EN-V2X operation.

### 5.5E.2 Intra-band contiguous EN-V2X operation in FR1

Table 5.5E.2-1: Intra-band contiguous EN-V2X configurations

|  |  |
| --- | --- |
| EN-V2Xconfiguration | SL transmission EN-V2X configuration |
| EN-V2X\_(n)47AA | E-UTRA Band 47 or NR band n47 |
| NOTE 1: The EN-V2X UE only allow single SL transmission between Band 47 and NR band n47. |

### 5.5E.3 Intra-band non-contiguous EN-V2X operation in FR1

Table 5.5E.3-1: Intra-band non-contiguous EN-V2X configurations

|  |  |
| --- | --- |
| EN-V2Xconfiguration | SL transmission EN-V2X configuration |
| EN-V2X\_47A\_n47A | E-UTRA Band 47 or NR band n47 |
| NOTE 1: The EN-V2X UE only allow single SL transmission between Band 47 and NR band n47. |

### *<< Unchanged sections are omitted >>*

# 6 Transmitter characteristics

## 6.1 General

Unless otherwise stated the transmitter characteristics are specified at the antenna connector(s) of the UE for the bands operating on frequency range 1 and over the air of the UE for the bands operating on frequency range 2. The requirements for frequency range 1 and frequency range 2 can be verified separately. For the carrier in frequency range 1, requirements can be verified with NR FR2 link disabled. For the carrier in frequency range 2, requirements can be verified in OTA mode with E-UTRA connecting to the network by OTA without calibration.

Unless otherwise stated, requirements for NR transmitter written in TS 38.101-1 [2] and TS 38.101-2 [3] apply and are assumed anchor agnostic. Requirements are verified under conditions where anchor resources do not interfere NR operation.

For sub-clauses with suffix A or B: the minimum requirements for band combinations including Band n41 also apply for the corresponding band combinations with Band n90 replacing Band n41 but with otherwise identical parameters. For brevity the said band combinations with Band n90 are not listed in the tables below but are covered by this specification.

## 6.2 Void

## 6.2A Transmitter power for CA

### 6.2A.1 UE maximum output power for CA

#### 6.2A.1.1 Inter-band CA between FR1 and FR2

Table 6.2A.1.1-1: Void

For inter-band NR CA in FR1 and FR2 combined, the UE shall meet each transmitter power requirement specified in clause 6.2.1 of TS 38.101-1 [2] and clause 6.2.1 TS 38.101-2 [3] independently.

### 6.2A.2 UE maximum output power reduction for CA

#### 6.2A.2.1 Inter-band CA between FR1 and FR2

For inter-band NR CA between FR1 and FR2, UE maximum output power reduction specified in TS 38.101-1 [2] and TS 38.101-2 [3] apply for each frequency range respectively.

### 6.2A.3 UE additional maximum output power reduction for CA

For inter-band NR CA between FR1 and FR2, UE additional maximum output power reduction specified in TS 38.101-1 [2] and TS 38.101-2 [3] apply for each frequency range respectively.

### 6.2A.4 Configured output power for CA

#### 6.2A.4.1 Configured output power level

### *<< Unchanged sections are omitted >>*

## 6.2E Transmitter power for EN-V2X in FR1

For the EN-V2X operation bands specified in Table 5.2E.1-1.

### 6.2E.1 UE maximum output power for EN-V2X

#### 6.2E.1.1 UE maximum output power for Intra-band EN-V2X

For intra-band EN-V2X operating UE, the allowed UE maximum output power shall be applied in Table 6.2.2-1[4] for E-UTRA SL transmission or applied in Table 6.2.1-1 [2] for NR SL transmission, respectively.

### 6.2E.2 UE maximum output power reduction for EN-V2X

#### 6.2E.2.1 UE maximum output power reduction for Intra-band EN-V2X

For intra-band EN-V2X operating UE, maximum output power reduction specified in clause 6.2.3G [4] and in clause 6.2E.2 [2] apply, respectively.

### 6.2E.3 UE additional maximum output power reduction for EN-V2X

#### 6.2E.3.1 UE additional maximum output power reduction for Intra-band EN-V2X

For intra-band EN-V2X operating UE, additional maximum output power reduction specified in clause 6.2.4G [4] and in clause 6.2E.3 [2] apply, respectively.

### 6.2E.4 Configured output power for EN-V2X

#### 6.2E.4.1 UE configured output power for Intra-band EN-V2X

For intra-band EN-V2X operating UE, each UE configured output power specified in clause 6.2.5G [4] and in clause 6.2E.4 [2] apply, respectively.

## 6.3 Output power dynamics

Output power dynamics for EN-DC operations in FR1 and FR2 as specified in TS 38.101-1 [2] and TS 38.101-2 [3], respectively. E-UTRA as specified in TS 36.101 [4]. For intra-band contiguous EN-DC operation in FR1, minimum output power requirements specified in clause 6.3.1 of TS 38.101-1 [2] and clause 6.3.2 of TS 36.101 [4] shall only apply when the power of all NR and E-UTRA carriers are set to minimum value. Similarly, OFF power requirements specified in clause 6.3.2 of TS 38.101-1 [2] and clause 6.3.3 of TS 36.101 [4] shall only apply when the power of all NR and E-UTRA carriers are OFF. The OFF power condition in transmit ON/OFF time mask requirements specified in clause 6.3.3 of TS 38.101-1 [2] and clause 6.3.4 of TS 36.101 [4] is applicable only when all NR and E-UTRA carriers are OFF. If both E-UTRA and NR transition between ON and OFF states simultaneously, the longer transient time shall apply to both. If either E-UTRA or NR is OFF and the other carrier transitions from OFF to ON, then the transiet time associated with that carrier applies.

## 6.3A Output power dynamics for CA

For inter-band NR CA between FR1 and FR2, output power dynamics as specified in TS 38.101-1 [2] and TS 38.101-2 [3] apply for FR1 and FR2 respectively.

6.3B Output power dynamics for DC

### 6.3B.0 General

The E-UTRA and NR switching time mask defines the observation period between E-UTRA subframe and NR slot/mini-slot boundary. Both E-UTRA subframe and NR slot/mini-slot have ON power transmissions. The ON power is defined as the mean power over the symbol duration excluding any transient period. For E-UTRA subframe or NR slot/mini-slot having OFF power transmission, the general time mask for E-UTRA or NR shall apply.

For inter-band EN-DC, output power dynamics requirement for E-UTRA single carrier and CA operation specified in clauses 6.3 of TS 36.101 [4] and for NR single carrier and CA operation specified in clause 6.3 of TS 38.101-1 [2] and clause 6.3, 6.3A and 6.3D of TS 38.101-2 [3] apply.

### *<< Unchanged sections are omitted >>*

6.3E Output power dynamics for EN-V2X operation in FR1

### 6.3E.0 General

The E-UTRA SL and NR SL switching time mask defines the observation period between E-UTRA subframe and NR slot/mini-slot boundary. Both E-UTRA subframe and NR slot/mini-slot have ON power transmissions. The ON power is defined as the mean power over the symbol duration excluding any transient period. For E-UTRA subframe or NR slot/mini-slot having OFF power transmission, the general time mask for E-UTRA or NR shall apply.

For intra-band EN-V2X operation, the output power dynamics specified in clause 6.3.2G, 6.3.3G, 6.3.4G and 6.3.5G [4] shall be applied for E-UTRA SL transmission or the output power dynamics specified in clause 6.3E [2] shall be applied for NR SL transmission, respectively.

### 6.3E.1 Output power dynamics for EN-V2X without dual PA capability

For intra-band EN-V2X operation bands UE specified in subclause 5.3E.1 and 5.3E.2 without dual PA capability, the maximum UL switching time is defined as [TBD] us and SL reception interruption is allowed during SL switching time masks in Figure 6.3E.1-1 and Figure 6.3E.1-2 shall apply.



Figure 6.3E.1-1: EN-V2X UE switching time mask at n47 without dual PA capability



Figure 6.3E.1-2: EN-V2X UE switching time mask at n47 without dual PA capability

## 6.4 Void

## 6.4A Transmit signal quality for CA

### 6.4A.1 Frequency error for CA

For inter-band NR CA between FR1 and FR2, frequency error as specified in TS 38.101-1 [2] and TS 38.101-2 [3] apply for FR1 and FR2 respectively.

### 6.4A.2 Transmit modulation quality for CA

For inter-band NR CA between FR1 and FR2, transmit modulation quality as specified in TS 38.101-1 [2] and TS 38.101-2 [3] apply for FR1 and FR2 respectively.

### *<< Unchanged sections are omitted >>*

## 6.4E Transmit signal quality for EN-V2X operation in FR1

### 6.4E.1 Transmit modulation quality for intra-band EN-V2X

These requirements shall be applied both intra-band contiguous and intra-band non-contiguous EN-V2X operation UE

#### 6.4E.1.1 Frequency error

For intra-band EN-V2X operating UE, the requirement shall apply on each component carrier as defined in clause 6.5.1G in TS 36.101 [4] and in clause 6.4E.1 in TS 38.101-1 [2], respectively.

#### 6.4E.1.2 Transmit modulation quality

##### 6.4E.1.2.1 Error Vector Magnitude

For intra-band EN-V2X operating UE, the requirement shall apply on each SL transmission as defined in clause 6.5.2G.1 in TS 36.101 [4] and in clause 6.4E.2.1 in TS 38.101-1 [2], respectively.

##### 6.4E.1.2.2 Carrier leakage

For intra-band EN-V2X operating UE, the requirement shall apply on each SL transmission as defined in clause 6.5.2G.2 in TS 36.101 [4] and in clause 6.4E.2.2 in TS 38.101-1 [2], respectively.

##### 6.4E.1.2.3 In-band emissions

For intra-band EN-V2X operating UE, the requirement shall apply on each SL transmission as defined in clause 6.5.2G.3 in TS 36.101 [4] and in clause 6.4E.2.3 in TS 38.101-1 [2], respectively.

## 6.5 Void

## 6.5A Output RF spectrum emissions for CA

### 6.5A.1 Occupied bandwidth for CA

For inter-band NR CA between FR1 and FR2, occupied bandwidth specified in TS 38.101-1 [2] and TS 38.101-2 [3] apply for each frequency range respectively.

### 6.5A.2 Out-of-band emissions for CA

For inter-band NR CA between FR1 and FR2, out-of-band emissions specified in TS 38.101-1 [2] and TS 38.101-2 [3] apply for each frequency range respectively.

### *<< Unchanged sections are omitted >>*

## 6.5E Output RF spectrum emissions for EN-V2X operation in FR1

### 6.5E.1 Occupied bandwidth

6.5E.1.1 Intra-band EN-V2X

For intra-band EN-V2X, the occupied bandwidth specified in clause 6.6.1G in TS36.101 [4] and specified in clause 6.5E.1 in TS 38.101-1 [2] apply for each frequency range respectively.

### 6.5E.2 Out-of-band emissions

6.5E.2.1 Intra-band EN-V2X

For intra-band EN-V2X, out-of-band emissions specified in clause 6.6.2G in TS36.101 [4] and specified in clause 6.5E.2 in TS 38.101-1 [2] apply for each frequency range respectively.

### 6.5E.3 Spurious emissions

#### 6.5E.3.1 Intra-band EN-V2X

##### 6.5E.3.1.1 General spurious emissions

For intra-band EN-V2X, the general spurious emissions requirements specified in clause 6.6.3.1 of TS 36.101 [4] and clause 6.5E.3.1 of TS 38.101-1 [2] apply for each frequency range respectively.

##### 6.5E.3.1.2 Spurious emission band UE co-existence

For intra-band EN-V2X, the spurious emissions band UE co-existence requirements specified in clause 6.6.3.2 of TS 36.101 [4] and clause 6.5E.3.2 of TS 38.101-1 [2] apply for each frequency range respectively.

### 6.5E.4 Transmit intermodulation

#### 6.5E.4.1 Intra-band EN-V2X

For intra-band EN-V2X, transmit intermodulation requirements specified in clause 6.7.1G of TS 36.101 [4] and clause 6.5E.4 of TS 38.101-1 [2] apply for each frequency range respectively.

### *<< Unchanged sections are omitted >>*

# 7 Receiver characteristics

## 7.1 General

Unless otherwise stated the receiver characteristics are specified at the antenna connector(s) of the UE for the bands operating on frequency range 1 and over the air of the UE for the bands operating on frequency range 2. The requirements for frequency range 1 and frequency range 2 can be verified separately. For the carrier in frequency range 1, requirements can be verified with NR FR2 link disabled. For the carrier in frequency range 2, requirements can be verified in OTA mode with E-UTRA connecting to the network by OTA without calibration.

The requirements defined in this clause are the extra requirements compared with the single carrier requirements defined in TS 38.101-1 [2] and TS 38.101-2 [3].

Unless otherwise stated, the UL and DL reference measurement channels are the same with the configurations specified in TS 38.101-1 [2] and TS 38.101-2 [3].

Unless otherwise stated, requirements for NR receiver written in TS 38.101-1 [2] and TS 38.101-2 [3] apply and are assumed anchor agnostic. Requirements are verified under conditions where anchor resources do not interfere NR operation.

For intra-band non-contiguous EN-DC, the output power is configured as follows:

- One E-UTRA uplink carrier with the output power set to 4dB Below PCMAX\_L and the NR band whose downlink is being tested has its uplink carrier output power set to minimum output power as defined in clause 6.3.1 of TS 38.101-1 [2].

- One NR uplink carrier with the output power set to 4dB Below PCMAX\_L and the E-UTRA band whose downlink is being tested has its uplink carrier output power set to minimum output power as defined in clause 6.3.2.1 of TS 36.101 [4].

For the additional requirements for intra-band non-contiguous EN-DC of two sub-blocks, an in-gap test refers to the case when the interfering signal is located at a negative offset with respect to the assigned lowest channel frequency of the highest sub-block and located at a positive offset with respect to the assigned highest channel frequency of the lowest sub-block.

For the additional requirements for intra-band non-contiguous EN-DC of two sub-blocks, an out-of-gap test refers to the case when the interfering signal(s) is (are) located at a positive offset with respect to the assigned channel frequency of the highest carrier frequency or located at a negative offset with respect to the assigned channel frequency of the lowest carrier frequency.

For the additional requirements for intra-band non-contiguous EN-DC of two sub-blocks with channel bandwidth larger than or equal to 5 MHz, the existing adjacent channel selectivity requirements, in-band blocking requirements (for each case), and narrow band blocking requirements apply for in-gap tests only if the corresponding interferer frequency offsets with respect to the two measured carriers satisfy the following condition in relation to the sub-block gap size Wgap for at least one of the E-UTRA or NR sub-blocks, so that the interferer frequency position does not change the nature of the core requirement tested:

 Wgap ≥ 2∙|FInterferer (offset)| – BWChannel

For the E-UTRA sub-block, the FInterferer (offset), for a sub-block with a single component carrier is the interferer frequency offset with respect to carrier as specified in clause 7.5.1, clause 7.6.1 and clause 7.6.3 for the respective requirement in TS 36.101 [4] and BWChannel. FInterferer (offset) for the E-UTRA sub-block with two or more contiguous component carriers is the interference frequency offset with respect to the carrier adjacent to the gap is specified in clause 7.5.1A, 7.6.1A and 7.6.3A in TS 36.101 [4].

For the NR sub-block, the FInterferer (offset), for a sub-block with a single component carrier is the interferer frequency offset with respect to carrier as specified in clause 7.5.1, clause 7.6.1 and clause 7.6.3 for the respective requirement in TS 38.101-1 [2] and BWChannel.

The interferer frequency offsets for adjacent channel selectivity, each in-band blocking case and narrow-band blocking shall be tested separately with a single in-gap interferer at a time.

For sub-clauses with suffix A or B: the minimum requirements for band combinations including Band n41 also apply for the corresponding band combinations with Band n90 replacing Band n41 but with otherwise identical parameters. For brevity the said band combinations with Band n90 are not listed in the tables below but are covered by this specification.

## 7.2 Void

## 7.3 Void

## 7.3A Reference sensitivity for CA

### 7.3A.1 General

### *<< Unchanged sections are omitted >>*

## 7.3E Reference sensitivity for EN-V2X operation in FR1

### 7.3E.1 General

For EN-V2X operation of REFSENS requirements defined in TS 38.101-1 [2] and TS 36.101 [4] apply to all downlink bands of EN-V2X configurations listed in clause 5.5E, unless sensitivity degradation exception is allowed in this clause of this specification, clause 7.3E in TS 38.101-1 [2] or clause 7.3.1G in TS 36.101 [4].

In case of intra-band EN-V2X, the each REFSENS requirements specified in clause 7.3.1G of TS 36.101 [4] and clause 7.3E.2 of TS 38.101-1 [2] apply when all SL reception CCs are activated at same time.

## 7.4 Void

## 7.4A Maximum input level for CA

For inter-band NR CA between FR1 and FR2, the maximum input level specified in TS 38.101-1 [2] and TS 38.101-2 [3] apply for FR1 and FR2 respectively.

## 7.4B Maximum input level for DC in FR1

### 7.4B.1 Intra-band contiguous EN-DC in FR1

Intra-band contiguous EN-DC maximum input level requirement and parameters are defined in Table 7.4B.1-1.

Table 7.4B.1-1: Maximum Input

|  |  |
| --- | --- |
| **Power in Largest CC, E-UTRA or NR, dBm** | X1 |
| **Power in each other CC, dBm** | X1 – 10\*log10(NxSCSx/NySCSy) |
| NOTE 1: Power in Largest E-UTRA or NR bandwidth CC, listed in Table 7.4-1 [2]NOTE 2: Nx, SCSx is the number of RB's and Sub carrier spacing in the largest carrier bandwidth and could be E-UTRA or NR carrierNOTE 3: Ny, SCSy is the number of RB's in any other carrier.NOTE 4: For NR carrier, the transmitter shall be set to 4dB below PCMAX\_L at the minimum uplink configuration specified in Table 7.3.2-3 [2] with PCMAX\_L as defined in clause 6.2B.4.NOTE 5: For E-UTRA carrier, the transmitter shall be set to 4dB below PCMAX\_L at the minimum uplink configuration specified in Table 7.3.1-2 with PCMAX\_L as defined in clause 6.2B.4 for single carrier. |

### *<< Unchanged sections are omitted >>*

## 7.4E Maximum input level for EN-V2X operation in FR1

For intra-band EN-V2X UE, the maximum input requirements specified in clause 7.4.1G of TS 36.101 [4] and clause 7.4E.2 of TS 38.101-1 [2] apply when all SL reception CCs are activated at same time.

## 7.5 Void

## 7.5A Adjacent channel selectivity for CA

For inter-band NR CA between FR1 and FR2, the adjacent channel selectivity specified in TS 38.101-1 [2] and TS 38.101-2 [3] apply for FR1 and FR2 respectively.

## 7.5B Adjacent channel selectivity for DC in FR1

### *<< Unchanged sections are omitted >>*

## 7.5E Adjacent channel selectivity for EN-V2X operation in FR1

For intra-band EN-V2X operation, the adjacent channel selectivity specified in clause 7.5.1G in TS 36.101 [4] and specified in clause 7.5E in TS 38.101-1 [2] apply when all SL reception CCs are activated at same time.

## 7.6 Void

## 7.6A Blocking characteristics for CA

For inter-band NR CA between FR1 and FR2, the in-band blocking characteristics specified in TS 38.101-1 [2] and TS 38.101-2 [3] apply for FR1 and FR2 respectively. The narrow band blocking and out-of-band blocking specified in TS 38.101-1 [2] apply for FR1.

## 7.6B Blocking characteristics for DC in FR1

### 7.6B.1 General

### *<< Unchanged sections are omitted >>*

## 7.6E Blocking characteristics for EN-V2X in FR1

For intra-band EN-V2X operation, the blocking charateristics specified in clause 7.6.1.1G in TS 36.101 [4] and specified in clause 7.6E in TS 38.101-1 [2] apply when all SL reception CCs are activated at same time.

## 7.7 Void

## 7.7A Spurious response for CA

For inter-band NR CA between FR1 and FR2, the spurious response specified in TS 38.101-1 [2] apply for FR1.

## 7.7B Spurious response for DC in FR1

### 7.7B.1 Intra-band contiguous EN-DC in FR1

Intra-band contiguous EN-DC spurious response requirement and parameters are defined in Table 7.7B.1-1.

### *<< Unchanged sections are omitted >>*

## 7.7E Spurious response for DC in FR1

For intra-band EN-V2X operation, the spurious response specified in clause 7.7.1G in TS 36.101 [4] and specified in clause 7.7E in TS 38.101-1 [2] apply when all SL reception CCs are activated at same time.

## 7.8 Void

## 7.8A Intermodulation characteristics for CA

For inter-band NR CA between FR1 and FR2, the intermodulation characteristics specified in TS 38.101-1 [2] apply for FR1.

## 7.8B Intermodulation characteristics for DC in FR1

### *<< Unchanged sections are omitted >>*

## 7.8E Intermodulation characteristics for EN-V2X operation in FR1

For intra-band EN-V2X operation, the intermodulation characteristics specified in clause 7.8.1G in TS 36.101 [4] and specified in clause 7.8E in TS 38.101-1 [2] apply when all SL reception CCs are activated at same time.

## *<< End of changes >>*