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| 3GPP TR 37.717-00-00 V0.5.0 (2021-05) | |
| Technical Report | |
| 3rd Generation Partnership Project;  Technical Specification Group Radio Access Networks;  Band combinations for SA NR Supplementary uplink (SUL), NSA NR SUL, NSA NR SUL with UL sharing from the UE perspective (ULSUP)  (Release 17) | |
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# Foreword

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

The contents of the present document are subject to continuing work within the TSG and may change following formal TSG approval. Should the TSG modify the contents of the present document, it will be re-released by the TSG with an identifying change of release date and an increase in version number as follows:

Version x.y.z

where:

x the first digit:

1 presented to TSG for information;

2 presented to TSG for approval;

3 or greater indicates TSG approved document under change control.

y the second digit is incremented for all changes of substance, i.e. technical enhancements, corrections, updates, etc.

z the third digit is incremented when editorial only changes have been incorporated in the document.

In the present document, modal verbs have the following meanings:

**shall** indicates a mandatory requirement to do something

**shall not** indicates an interdiction (prohibition) to do something

The constructions "shall" and "shall not" are confined to the context of normative provisions, and do not appear in Technical Reports.

The constructions "must" and "must not" are not used as substitutes for "shall" and "shall not". Their use is avoided insofar as possible, and they are not used in a normative context except in a direct citation from an external, referenced, non-3GPP document, or so as to maintain continuity of style when extending or modifying the provisions of such a referenced document.

**should** indicates a recommendation to do something

**should not** indicates a recommendation not to do something

**may** indicates permission to do something

**need not** indicates permission not to do something

The construction "may not" is ambiguous and is not used in normative elements. The unambiguous constructions "might not" or "shall not" are used instead, depending upon the meaning intended.

**can** indicates that something is possible

**cannot** indicates that something is impossible

The constructions "can" and "cannot" are not substitutes for "may" and "need not".

**will** indicates that something is certain or expected to happen as a result of action taken by an agency the behaviour of which is outside the scope of the present document

**will not** indicates that something is certain or expected not to happen as a result of action taken by an agency the behaviour of which is outside the scope of the present document

**might** indicates a likelihood that something will happen as a result of action taken by some agency the behaviour of which is outside the scope of the present document

**might not** indicates a likelihood that something will not happen as a result of action taken by some agency the behaviour of which is outside the scope of the present document

In addition:

**is** (or any other verb in the indicative mood) indicates a statement of fact

**is not** (or any other negative verb in the indicative mood) indicates a statement of fact

The constructions "is" and "is not" do not indicate requirements.

# 1 Scope

The present document is a technical report for SA NR Supplementary uplink (SUL), NSA NR SUL and NSA NR SUL with UL sharing from the UE perspective (ULSUP) under Rel-17 time frame. The purpose is to gather the relevant background information and studies in order to address NR SUL for the Rel-17 bands/band combinations in Table 1-1 to Table 1-4.

Table 1-1: Release 17 SUL bands

|  |  |  |  |
| --- | --- | --- | --- |
| **Band number** | **UL** | **DL** | **Duplex mode** |
| n97 | 2300 MHz – 2400 MHz | N/A | SUL |
| n98 | 1880 MHz – 1920 MHz | N/A | SUL |
| n99 | 1626.5 MHz – 1660.5 MHz | N/A | SUL |

Table 1-2: Release 17 SA SUL band combinations

|  |  |
| --- | --- |
| **SA SUL band combination** | **REL independent from** |
| SUL\_n41-n83 | Rel-15 |
| SUL\_n79-n83 | Rel-15 |
| CA\_n28\_SUL\_n41-n83 | Rel-15 |
| CA\_n28\_SUL\_n79-n83 | Rel-15 |
| CA\_n1\_SUL\_n78-n80 | Rel-15 |
| CA\_n1\_SUL\_n78-n84 | Rel-15 |
| CA\_n41\_SUL\_n79-n80 | Rel-15 |
| CA\_n79\_SUL\_n41-n80 | Rel-15 |
| CA\_n3\_SUL\_n78-n80 | Rel-15 |
| CA\_n41\_SUL\_n79-n83 | Rel-15 |
| CA\_n79\_SUL\_n41-n83 | Rel-15 |
| SUL\_n79-n97 | Rel-15 |
| SUL\_n41-n98 | Rel-15 |
| SUL\_n79-n98 | Rel-15 |
| SUL\_n41-n99 | Rel-15 |
| SUL\_n48-n99 | Rel-15 |
| SUL\_n77-n99 | Rel-15 |
| SUL\_n41-n97 | Rel-15 |
| SUL\_n24-n99 | Rel-15 |
| CA\_n3\_SUL\_n41-n80 | Rel-15 |
| CA\_n3\_SUL\_n79-n80 | Rel-15 |

Table 1-3: Release 17 NSA SUL band combinations

|  |  |
| --- | --- |
| **NSA SUL band combination** | **REL independent from** |
|  |  |

Table 1-4: Release 17 NSA SUL with ULSUP band combinations

|  |  |
| --- | --- |
| **NSA SUL with ULSUP band combination** | **REL independent from** |
| DC\_28\_SUL\_n41-n83 | Rel-15 |

This TR contains a general part and specific band combination part. The actual requirements are added to the corresponding technical specifications.

# 2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication, edition number, version number, etc.) or non‑specific.

- For a specific reference, subsequent revisions do not apply.

- For a non-specific reference, the latest version applies. In the case of a reference to a 3GPP document (including a GSM document), a non-specific reference implicitly refers to the latest version of that document *in the same Release as the present document*.

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

[2] RP-201026, " New WID on Rel-17 Band combinations for SA NR Supplementary uplink (SUL), NSA NR SUL, NSA NR SUL with UL sharing from the UE perspective (ULSUP)", RAN#88

# 3 Definitions of terms, symbols and abbreviations

## 3.1 Terms

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

**example:** text used to clarify abstract rules by applying them literally.

## 3.2 Symbols

For the purposes of the present document, the following symbols apply:

<symbol> <Explanation>

ΔRIB,c Allowed reference sensitivity relaxation due to support for inter-band CA operation, for serving cell *c*.

ΔTIB,c Allowed maximum configured output power relaxation due to support for inter-band CA operation, for serving cell *c*.

## 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].

<ABBREVIATION> <Expansion>

BS Base Station

BCS Bandwidth Combination Set

CA Carrier Aggregation

CC Component Carriers

DC Dual Connectivity

DL Downlink

E-UTRA Evolved UMTS Terrestrial Radio Access

FDD Frequency Division Duplex

MPR Allowed maximum power reduction

MSD Maximum Sensitivity Degradation

REFSENS Reference Sensitivity power level

SCS Subcarrier spacing

SUL Supplementary uplink

TDD Time Division Duplex

UE User Equipment

UL Uplink

ULSUP UL sharing from the UE perspective

# 4 Background

The present document is a technical report for SA NR SUL, NSA NR SUL and NSA NR SUL with UL sharing from ULSUP under Rel-17 time frame. It covers both the UE and BS side. The document is divided in different parts:

- Specific SA NR SUL part: this part covers each band combination and its specific issues independently from each other (i.e. one subclause is defined per band combination)

- Specific NSA NR SUL part: this part covers each band combination and its specific issues independently from each other (i.e. one subclause is defined per band combination)

- Specific NSA NR SUL with UL sharing from ULSUP part: this part covers each band combination and its specific issues independently from each other (i.e. one subclause is defined per band combination)

## 4.1 TR Maintenance

A single company is responsible for introducing all approved TPs in the current TR, i.e. TR editor. However, it is the responsibility of the contact person of each band/band combination to ensure that the TPs related to the band/band combination have been implemented.

# 5 SA NR SUL band combination: Specific Band Combination Part

## 5.1 SUL\_n41A-n83A

### 5.1.1 Operating bands

**Table 5.1.1-1: SUL band combination**

|  |  |
| --- | --- |
| NR Band combination for SUL | NR Band  (Table 5.2-1) |
| SUL\_n41-n832 | n41, n83 |
| NOTE 1: If a UE is configured with both NR UL and NR SUL carriers in a cell, the switching time between NR UL carrier and NR SUL carrier is 0 us.  NOTE 2: For UE supporting SUL band combination simultaneous Rx/Tx capability is mandatory. | |

### 

### 5.1.2 Channel bandwidths per operating band

**Table 5.1.2-1: Supported bandwidths per SUL band combination**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **SUL configuration** | **NR Band** | **Subcarrier spacing**  **(kHz)** | **5**  **MHz** | **10**  **MHz** | **15**  **MHz** | **20**  **MHz** | **25 MHz** | **30 MHz** | **40**  **MHz** | **50**  **MHz** | **60**  **MHz** | **80**  **MHz** | 90  MHz | **100 MHz** | **Bandwidth combination set** |
| SUL\_n41A-n83A | n41 | 15 |  | Yes | Yes | Yes |  | Yes | Yes | Yes |  |  |  |  | 0 |
| 30 |  | Yes | Yes | Yes |  | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| 60 |  | Yes | Yes | Yes |  | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| n83 | 15 | Yes | Yes | Yes | Yes |  | Yes |  |  |  |  |  |  |
| 30 |  | Yes | Yes | Yes |  | Yes |  |  |  |  |  |  |

### 

### 5.1.3 Maximum output power

There is only single UL in uplink so this requirement is not applicable.

### 5.1.4 Spurious emission band UE co-existence

There is only single UL in uplink so this requirement is not applicable*.*

### 5.1.5 MSD

For SUL operation, the reference receive sensitivity (REFSENS) requirement for downlink bands shall be met for a supplementary uplink transmission bandwidth less than or equal to that in Table 5.1.5-1.

Table 5.1.5-1: Supplementary Uplink configuration for reference sensitivity

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| NR Band / SCS of SUL band / Channel bandwidth of the DL band / NRB | | | | | | | | | | | | | | |
| DL band | SUL band | SCS of SUL band  (kHz) | 5  MHz | 10 MHz | 15 MHz | 20 MHz | 25 MHz | 30 MHz | 40 MHz | 50 MHz | 60 MHz | 80 MHz | 90 MHz | 100 MHz |
| n41 | n83 | 15 |  | 100 | 100 | 100 |  | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| n41 | n83 | 30 |  | 50 | 50 | 50 |  | 50 | 50 | 50 | 50 | 50 | 50 | 50 |

For SUL\_n41-n83, there is no harmonic or harmonic mixing product generated by Band n83 that may fall into the RX band of Band n41. Therefore, MSD due to harmonic or harmonic mixing is not needed.

### 5.1.6 ∆TIB and ∆RIB values

For SUL\_n41-n83, the ∆TIB,c and ∆RIB values are given in the tables below.

Table 5.1.6-1: ΔTIB,c

| **SUL Band combination** | **NR Band** | **ΔTIB,c [dB]** |
| --- | --- | --- |
| SUL\_n41-n83 | n41 | 0.3 |
| n83 | 0.3 |

Table 5.1.6-2: ΔRIB,c

| **SUL Band combination** | **NR Band** | **ΔRIB,c [dB]** |
| --- | --- | --- |
| SUL\_n41-n83 | n41 | 0 |

## 5.2 SUL\_n79A-n83A

### 5.2.1 Operating bands

**Table 5.2.1-1: SUL band combination**

|  |  |
| --- | --- |
| NR Band combination for SUL | NR Band  (Table 5.2-1) |
| SUL\_n79-n832 | n79, n83 |
| NOTE 1: If a UE is configured with both NR UL and NR SUL carriers in a cell, the switching time between NR UL carrier and NR SUL carrier is 0 us.  NOTE 2: For UE supporting SUL band combination simultaneous Rx/Tx capability is mandatory. | |

### 5.2.2 Channel bandwidths per operating band

**Table 5.2.2-1: Supported bandwidths per SUL band combination**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **SUL configuration** | **NR Band** | **Subcarrier spacing**  **(kHz)** | **5**  **MHz** | **10**  **MHz** | **15**  **MHz** | **20**  **MHz** | **25 MHz** | **30 MHz** | **40**  **MHz** | **50**  **MHz** | **60**  **MHz** | **80**  **MHz** | 90  MHz | **100 MHz** | **Bandwidth combination set** |
| SUL\_n79A-n83A | n79 | 15 |  |  |  |  |  |  | Yes | Yes |  |  |  |  | 0 |
| 30 |  |  |  |  |  |  | Yes | Yes | Yes | Yes |  | Yes |
| 60 |  |  |  |  |  |  | Yes | Yes | Yes | Yes |  | Yes |
| n83 | 15 | Yes | Yes | Yes | Yes |  | Yes |  |  |  |  |  |  |
| 30 |  | Yes | Yes | Yes |  | Yes |  |  |  |  |  |  |

### 5.2.3 Maximum output power

There is only single UL in uplink so this requirement is not applicable.

### 5.2.4 Spurious emission band UE co-existence

There is only single UL in uplink so this requirement is not applicable*.*

### 5.2.5 MSD

For SUL operation, the reference receive sensitivity (REFSENS) requirement for downlink bands shall be met for a supplementary uplink transmission bandwidth less than or equal to that in Table 5.2.5-1.

Table 5.2.5-1: Supplementary Uplink configuration for reference sensitivity

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| NR Band / SCS of SUL band / Channel bandwidth of the DL band / NRB | | | | | | | | | | | | | | |
| DL band | SUL band | SCS of SUL band  (kHz) | 5  MHz | 10 MHz | 15 MHz | 20 MHz | 25 MHz | 30 MHz | 40 MHz | 50 MHz | 60 MHz | 80 MHz | 90 MHz | 100 MHz |
| n79 | n83 | 15 |  |  |  |  |  |  | 100 | 100 | 100 | 100 |  | 100 |
| n79 | n83 | 30 |  |  |  |  |  |  | 50 | 50 | 50 | 50 |  | 50 |

For SUL\_n79-n83, there is no harmonic or harmonic mixing product generated by Band n83 that may fall into the RX band of Band n79. Therefore, MSD due to harmonic or harmonic mixing is not needed.

### 5.2.6 ∆TIB and ∆RIB values

For SUL\_n79-n83, the ∆TIB,c and ∆RIB values are given in the tables below.

Table 5.2.6-1: ΔTIB,c

| **SUL Band combination** | **NR Band** | **ΔTIB,c [dB]** |
| --- | --- | --- |
| SUL\_n79-n83 | n79 | 0.8 |
| n83 | 0.5 |

Table 5.2.6-2: ΔRIB,c

| **SUL Band combination** | **NR Band** | **ΔRIB,c [dB]** |
| --- | --- | --- |
| SUL\_n79-n83 | n79 | 0.5 |

### 5.2.7 Out-of-band blocking exceptions

For SUL\_n79-n83, exceptions to the requirement specified in TS 38.101-1 Table 7.6C.3-2 are allowed since the intermodulation product of the SUL carrier and the CW interfering signal fully or partially overlaps with the DL carrier.

Table 5.2.7-1: SUL operating band combination with out-of-band exceptions allowed

|  |
| --- |
| NR Band combination for SUL |
| SUL\_n79-n83 |

5.3 CA\_n28\_SUL\_n41-n83

5.3.1 Operating bands

**Table 5.3.1-1: SUL band combination**

|  |  |
| --- | --- |
| NR Band combination for SUL | NR Band  (Table 5.2-1) |
| CA\_n28\_SUL\_n41-n83 | n28, n41, n83 |
| NOTE 1: If a UE is configured with both NR UL and NR SUL carriers in a cell, the switching time between NR UL carrier and NR SUL carrier is 0 us.  NOTE 2: For UE supporting SUL band combination simultaneous Rx/Tx capability is mandatory. | |

5.3.2 Channel bandwidths per operating band

**Table 5.3.2-1: Supported bandwidths per SUL band combination**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **SUL band combination with CA** | **UL configuration** | **NR Band** | **Subcarrier spacing**  **(kHz)** | **5**  **MHz** | **10**  **MHz** | **15**  **MHz** | **20**  **MHz** | **25 MHz** | **30 MHz** | **40**  **MHz** | **50**  **MHz** | **60**  **MHz** | **80**  **MHz** | 90  MHz | **100 MHz** | **Bandwidth combination set** |
| CA\_n28A\_SUL\_n41A-n83A | SUL\_n41A-n83A | n28 | 15 | Yes | Yes | Yes | Yes |  | Yes |  |  |  |  |  |  | 0 |
| 30 |  | Yes | Yes | Yes |  | Yes |  |  |  |  |  |  |
| 60 |  |  |  |  |  |  |  |  |  |  |  |  |
| n41 | 15 |  | Yes | Yes | Yes |  | Yes | Yes | Yes |  |  |  |  |
| 30 |  | Yes | Yes | Yes |  | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| 60 |  | Yes | Yes | Yes |  | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| n83 | 15 | Yes | Yes | Yes | Yes |  | Yes |  |  |  |  |  |  |
| 30 |  | Yes | Yes | Yes |  | Yes |  |  |  |  |  |  |
| 60 |  |  |  |  |  |  |  |  |  |  |  |  |
| CA\_n28A\_SUL\_n41C-n83A | SUL\_n41A-n83A | n28 | 15 | Yes | Yes | Yes | Yes |  | Yes |  |  |  |  |  |  | 0 |
| 30 |  | Yes | Yes | Yes |  | Yes |  |  |  |  |  |  |
| 60 |  |  |  |  |  |  |  |  |  |  |  |  |
| n41 | See CA\_n41C Bandwidth Combination Set 1 in Table 5.5A.1-1 | | | | | | | | | | | | |
| n83 | 15 | Yes | Yes | Yes | Yes |  | Yes |  |  |  |  |  |  |
| 30 |  | Yes | Yes | Yes |  | Yes |  |  |  |  |  |  |

5.3.3 Maximum output power

There is only single UL in uplink so this requirement is not applicable.

5.3.4 Spurious emission band UE co-existence

There is only single UL in uplink so this requirement is not applicable*.*

5.3.5 REFSENS requirements

For SUL operation with downlink CA, the reference receive sensitivity (REFSENS) requirement for downlink bands specified in clause 7.3A.2 from TS 38.101-1 shall be met when supplementary uplink configuration for reference sensitivity are specified as below.

Table 5.3.5-1: Supplementary uplink configuration for reference sensitivity

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| NR Band / SCS of SUL band / Channel bandwidth of the DL band / NRB | | | | | | | | | | | | | | |
| DL band | SUL band | SCS of SUL band  (kHz) | 5  MHz | 10 MHz | 15 MHz | 20 MHz | 25 MHz | 30 MHz | 40 MHz | 50 MHz | 60 MHz | 80 MHz | 90 MHz | 100 MHz |
| n28 | n83 | 15 | 100 | 100 | 100 | 100 |  | 100 |  |  |  |  |  |  |
| 30 |  | 50 | 50 | 50 |  | 50 |  |  |  |  |  |  |
| n41 | n83 | 15 |  | 100 | 100 | 100 |  | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| 30 |  | 50 | 50 | 50 |  | 50 | 50 | 50 | 50 | 50 | 50 | 50 |
|  | | | | | | | | | | | | | | |

The reference sensitivity exception between band n83 and n28 are specified below. The reference sensitivity exception between band n83 and n28 are specified below. The operation is limited to using equal or wider separation from n83 Tx to n28 Rx compared to n28 Tx-Rx separation. The reference sensitivity exception does not take into account the condition where band n83 channel bandwidths is wider than band n28. Otherwise, UE REFSENS performance will be degraded.

Table 5.3.5-2: Reference sensitivity exceptions due to cross band isolation

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| UL band | DL band | 5 MHz  (dBm) | 10 MHz  (dBm) | 15 MHz  (dBm) | 20 MHz  (dBm) | 25 MHz  (dBm) | 30 MHz  (dBm) | 40 MHz  (dBm) | 50 MHz  (dBm) | 60 MHz  (dBm) | 80 MHz  (dBm) | 90 MHz  (dBm) | 100 MHz  (dBm) |
| n83 | n28 | 0 | 0 | 0 | 0 |  | 0 |  |  |  |  |  |  |
|  | | | | | | | | | | | | | |

Table 5.3.5-3: Uplink configuration for reference sensitivity exceptions due to cross band isolation

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| UL band | DL band | 5 MHz  (dBm) | 10 MHz  (dBm) | 15 MHz  (dBm) | 20 MHz  (dBm) | 25 MHz  (dBm) | 30 MHz  (dBm) | 40 MHz  (dBm) | 50 MHz  (dBm) | 60 MHz  (dBm) | 80 MHz  (dBm) | 90 MHz  (dBm) | 100 MHz  (dBm) |
| n831 | n28 | 25 | 25 | 25 | 25 |  | 25 |  |  |  |  |  |  |
| NOTE 1: The Tx-Rx carrier center frequency separation between SUL band and DL band is the same as the Tx-Rx carrier center frequency separation of DL band specified in table 5.4.4-1. The channel bandwidth of SUL band is the same as DL band. | | | | | | | | | | | | | |

5.3.6 ∆TIB and ∆RIB values

For CA\_n28\_SUL\_n41-n83, the ΔTIB,c and ΔRIB,c values are given in the tables below.

**Table 5.3.6-1: ΔTIB,c**

| SUL Band combination | NR Band | ΔTIB,c [dB] |
| --- | --- | --- |
| CA\_n28\_SUL\_n41-n83 | n28 | 0.3 |
| n41 | 0.3 |
| n83 | 0.3 |

**Table 5.3.6-2: ΔRIB,c**

| SUL Band combination | NR Band | ΔRIB,c [dB] |
| --- | --- | --- |
| CA\_n28\_SUL\_n41-n83 | n28 | 0.2 |
| n41 | 0 |

5.4 CA\_n28A\_SUL\_n79A-n83A

5.4.1 Operating bands

**Table 5.4.1-1: SUL band combination**

|  |  |
| --- | --- |
| NR Band combination for SUL | NR Band  (Table 5.2-1) |
| CA\_n28-\_SUL\_n79-n83 | n28, n79, n83 |
| NOTE 1: If a UE is configured with both NR UL and NR SUL carriers in a cell, the switching time between NR UL carrier and NR SUL carrier is 0 us.  NOTE 2: For UE supporting SUL band combination simultaneous Rx/Tx capability is mandatory. | |

5.4.2 Channel bandwidths per operating band

**Table 5.4.2-1: Supported bandwidths per SUL band combination**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **SUL band combination with CA** | **UL configuration** | **NR Band** | **Subcarrier spacing**  **(kHz)** | **5**  **MHz** | **10**  **MHz** | **15**  **MHz** | **20**  **MHz** | **25 MHz** | **30 MHz** | **40**  **MHz** | **50**  **MHz** | **60**  **MHz** | **80**  **MHz** | 90  MHz | **100 MHz** | **Bandwidth combination set** |
| CA\_n28A\_SUL\_n79A-n83A | SUL\_n79A-n83A | n28 | 15 | Yes | Yes | Yes | Yes |  | Yes |  |  |  |  |  |  | 0 |
| 30 |  | Yes | Yes | Yes |  | Yes |  |  |  |  |  |  |
| 60 |  |  |  |  |  |  |  |  |  |  |  |  |
| n79 | 15 |  |  |  |  |  |  | Yes | Yes |  |  |  |  |
| 30 |  |  |  |  |  |  | Yes | Yes | Yes | Yes |  | Yes |
| 60 |  |  |  |  |  |  | Yes | Yes | Yes | Yes |  | Yes |
| n83 | 15 | Yes | Yes | Yes | Yes |  | Yes |  |  |  |  |  |  |
| 30 |  | Yes | Yes | Yes |  | Yes |  |  |  |  |  |  |
| 60 |  |  |  |  |  |  |  |  |  |  |  |  |
| CA\_n28A\_SUL\_n79C-n83A | SUL\_n79A-n83A | n28 | 15 | Yes | Yes | Yes | Yes |  | Yes |  |  |  |  |  |  | 0 |
| 30 |  | Yes | Yes | Yes |  | Yes |  |  |  |  |  |  |
| 60 |  |  |  |  |  |  |  |  |  |  |  |  |
| n79 | See CA\_n79C Bandwidth Combination Set 0 in Table 5.5A.1-1 | | | | | | | | | | | | |
| n83 | 15 | Yes | Yes | Yes | Yes |  | Yes |  |  |  |  |  |  |
| 30 |  | Yes | Yes | Yes |  | Yes |  |  |  |  |  |  |

5.4.3 Maximum output power

There is only single UL in uplink so this requirement is not applicable.

5.4.4 Spurious emission band UE co-existence

There is only single UL in uplink so this requirement is not applicable*.*

5.4.5 REFSENS requirements

For SUL operation with downlink CA, the reference receive sensitivity (REFSENS) requirement for downlink bands specified in clause 7.3A.2 from TS 38.101-1 shall be met when supplementary uplink configuration for reference sensitivity are specified as below.

Table 5.4.5-1: Supplementary uplink configuration for reference sensitivity

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| NR Band / SCS of SUL band / Channel bandwidth of the DL band / NRB | | | | | | | | | | | | | | |
| DL band | SUL band | SCS of SUL band  (kHz) | 5  MHz | 10 MHz | 15 MHz | 20 MHz | 25 MHz | 30 MHz | 40 MHz | 50 MHz | 60 MHz | 80 MHz | 90 MHz | 100 MHz |
| n28 | n83 | 15 | 100 | 100 | 100 | 100 |  | 100 |  |  |  |  |  |  |
| 30 |  | 50 | 50 | 50 |  | 50 |  |  |  |  |  |  |
| n79 | n83 | 15 |  |  |  |  |  |  | 100 | 100 | 100 | 100 |  | 100 |
| 30 |  |  |  |  |  |  | 50 | 50 | 50 | 50 |  | 50 |
|  | | | | | | | | | | | | | | |

The reference sensitivity exception between band n83 and n28 are specified below. The reference sensitivity exception between band n83 and n28 are specified below. The operation is limited to using equal or wider separation from n83 Tx to n28 Rx compared to n28 Tx-Rx separation. The reference sensitivity exception does not take into account the condition where band n83 channel bandwidths is wider than band n28. Otherwise, UE REFSENS performance will be degraded.

Table 5.4.5-2: Reference sensitivity exceptions due to cross band isolation

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| UL band | DL band | 5 MHz  (dBm) | 10 MHz  (dBm) | 15 MHz  (dBm) | 20 MHz  (dBm) | 25 MHz  (dBm) | 30 MHz  (dBm) | 40 MHz  (dBm) | 50 MHz  (dBm) | 60 MHz  (dBm) | 80 MHz  (dBm) | 90 MHz  (dBm) | 100 MHz  (dBm) |
| n83 | n28 | 0 | 0 | 0 | 0 |  | 0 |  |  |  |  |  |  |
|  | | | | | | | | | | | | | |

Table 5.4.5-3: Uplink configuration for reference sensitivity exceptions due to cross band isolation

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| UL band | DL band | 5 MHz  (dBm) | 10 MHz  (dBm) | 15 MHz  (dBm) | 20 MHz  (dBm) | 25 MHz  (dBm) | 30 MHz  (dBm) | 40 MHz  (dBm) | 50 MHz  (dBm) | 60 MHz  (dBm) | 80 MHz  (dBm) | 90 MHz  (dBm) | 100 MHz  (dBm) |
| n83 | n28 | 25 | 25 | 25 | 25 |  | 25 |  |  |  |  |  |  |
| NOTE 1: The Tx-Rx carrier center frequency separation between SUL band and DL band is the same as the Tx-Rx carrier center frequency separation of DL band specified in table 5.4.4-1. The channel bandwidth of SUL band is the same as DL band. | | | | | | | | | | | | | |

5.4.6 ∆TIB and ∆RIB values

For CA\_n28\_SUL\_n79-n83, the ΔTIB,c and ΔRIB,c values are given in the tables below.

**Table 5.4.6-1: ΔTIB,c**

| SUL Band combination | NR Band | ΔTIB,c [dB] |
| --- | --- | --- |
| CA\_n28\_SUL\_n79-n83 | n28 | 0.5 |
| n79 | 0.8 |
| n83 | 0.5 |

**Table 5.4.6-2: ΔRIB,c**

| SUL Band combination | NR Band | ΔRIB,c [dB] |
| --- | --- | --- |
| CA\_n28\_SUL\_n79-n83 | n28 | 0.2 |
| n79 | 0.5 |

5.5 CA\_n1A\_SUL\_n78A-n80A

5.5.1 Operating bands

**Table 5.5.1-1: SUL band combination**

|  |  |
| --- | --- |
| NR Band combination for SUL | NR Band  (Table 5.2-1) |
| CA\_n1\_SUL\_n78-n80 | n1, n78, n80 |
| NOTE 1: If a UE is configured with both NR UL and NR SUL carriers in a cell, the switching time between NR UL carrier and NR SUL carrier is 0 us.  NOTE 2: For UE supporting SUL band combination simultaneous Rx/Tx capability is mandatory. | |

5.5.2 Channel bandwidths per operating band

**Table 5.5.2-1: Supported bandwidths per SUL band combination**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **SUL band combination with CA** | **UL configuration** | **NR Band** | **Subcarrier spacing**  **(kHz)** | **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** | **Bandwidth combination set** |
| CA\_n1A\_SUL\_n78A-n80A | SUL\_n78A-n80A | n1 | 15 | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |  |  |  |  |  | 0 |
| 30 |  | Yes | Yes | Yes | Yes | Yes | Yes | Yes |  |  |  |  |  |
| 60 |  | Yes | Yes | Yes | Yes | Yes | Yes | Yes |  |  |  |  |  |
| n78 | 15 |  | Yes | Yes | Yes | Yes | Yes | Yes | Yes |  |  |  |  |  |
| 30 |  | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| 60 |  | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| n80 | 15 | Yes | Yes | Yes | Yes | Yes | Yes | Yes |  |  |  |  |  |  |
| 30 |  | Yes | Yes | Yes | Yes | Yes | Yes |  |  |  |  |  |  |
| 60 |  | Yes | Yes | Yes | Yes | Yes | Yes |  |  |  |  |  |  |

5.5.3 Maximum output power

There is only single UL in uplink so this requirement is not applicable.

5.5.4 Spurious emission band UE co-existence

There is only single UL in uplink so this requirement specified in clause 6.5.3.2 from 38.101-1 is applicable.

Table 5.5.4-1 summarizes frequency ranges where harmonics and/or harmonics mixing occur for CA\_n1\_SUL\_n78-n80.

**Table 5.5.4-1: Impact of UL/DL Harmonic/Harmonic mixing**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  | **2nd Harmonic** | | **3rd Harmonic** | | **4th Harmonic** | |
| **Band** | | **Low Band Edge** | High Band Edge | Low Band Edge | High Band Edge | Low Band Edge | High Band Edge | Low Band Edge | High Band Edge |
| n1 | DL frequency range | 2110 | 2170 | 4220 | 4340 | 6330 | 6510 | 8440 | 8680 |
| n78 | UL/DL frequency range | 3300 | 3800 | 6600 | 7600 | 9900 | 11400 | 13200 | 15200 |
| n80 | UL frequency range | 1710 | 1785 | 3420 | 3570 | 5130 | 5355 | 6840 | 7140 |

The 2nd harmonic of band n80 may fall into Rx band of n78. The MSD has been specified into the clause 7.3C.2 from 38.101-1.

5.5.5 REFSENS requirements

For SUL operation with CA, the reference receive sensitivity (REFSENS) requirement for downlink bands specified in clause 7.3A.2 from TS 38.101-1 shall be met when supplementary uplink configuration for reference sensitivity are specified as below.

Table 5.5.5-1: Supplementary uplink configuration for reference sensitivity

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | NR Band / SCS of SUL band / Channel bandwidth of the DL band / NRB | | | | | | | | | | | | | | |
| DL band | SUL band | SCS of SUL band  (kHz) | 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 |
| n1 | n80 | 15 | 160 | 160 | 160 | 160 | 160 | 160 | 160 | 160 |  |  |  |  |  |
| n78 | n80 | 15 |  | 160 | 160 | 160 | 160 | 160 | 160 | 160 | 160 | 160 | 160 | 160 | 160 |
|  | | | | | | | | | | | | | | | |

5.5.6 ∆TIB and ∆RIB values

For CA\_n1\_SUL\_n78-n80, the ΔTIB,c and ΔRIB,c values are given in the tables below.

**Table 5.5.6-1: ΔTIB,c**

| SUL Band combination | NR Band | ΔTIB,c [dB] |
| --- | --- | --- |
| CA\_n1\_SUL\_n78-n80 | n1 | 0.6 |
| n78 | 0.8 |
| n80 | 0.6 |

**Table 5.5.6-2: ΔRIB,c**

| SUL Band combination | NR Band | ΔRIB,c [dB] |
| --- | --- | --- |
| CA\_n1\_SUL\_n78-n80 | n1 | 0.2 |
| n78 | 0.5 |

5.6 CA\_n1\_SUL\_n78-n84

5.6.1 Operating bands

**Table 5.6.1-1: SUL band combination**

|  |  |
| --- | --- |
| NR Band combination for SUL | NR Band  (Table 5.2-1) |
| CA\_n1\_SUL\_n78-n84 | n1, n78, n84 |
| NOTE 1: If a UE is configured with both NR UL and NR SUL carriers in a cell, the switching time between NR UL carrier and NR SUL carrier is 0 us.  NOTE 2: For UE supporting SUL band combination simultaneous Rx/Tx capability is mandatory. | |

5.6.2 Channel bandwidths per operating band

**Table 5.6.2-1: Supported bandwidths per SUL band combination**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **SUL band combination with CA** | **UL configuration** | **NR Band** | **Subcarrier spacing**  **(kHz)** | **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** | **Bandwidth combination set** |
| CA\_n1A\_SUL\_n78A-n84A | SUL\_n78A-n84A | n1 | 15 | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |  |  |  |  |  | 0 |
| 30 |  | Yes | Yes | Yes | Yes | Yes | Yes | Yes |  |  |  |  |  |
| 60 |  | Yes | Yes | Yes | Yes | Yes | Yes | Yes |  |  |  |  |  |
| n78 | 15 |  | Yes | Yes | Yes | Yes | Yes | Yes | Yes |  |  |  |  |  |
| 30 |  | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| 60 |  | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| n84 | 15 | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |  |  |  |  |  |
| 30 |  | Yes | Yes | Yes | Yes | Yes | Yes | Yes |  |  |  |  |  |
| 60 |  | Yes | Yes | Yes | Yes | Yes | Yes | Yes |  |  |  |  |  |
| CA\_n1A\_SUL\_n78C-n84A | SUL\_n78A-n84A | n1 | 15 | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |  |  |  |  |  | 0 |
| 30 |  | Yes | Yes | Yes | Yes | Yes | Yes | Yes |  |  |  |  |  |
| 60 |  | Yes | Yes | Yes | Yes | Yes | Yes | Yes |  |  |  |  |  |
| n78 | See CA\_n78C Bandwidth Combination Set 1 in Table 5.5A.1-1 | | | | | | | | | | | | | |
| n84 | 15 | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |  |  |  |  |  |
| 30 |  | Yes | Yes | Yes | Yes | Yes | Yes | Yes |  |  |  |  |  |
| 60 |  | Yes | Yes | Yes | Yes | Yes | Yes | Yes |  |  |  |  |  |

5.6.3 Maximum output power

There is only single UL in uplink so this requirement is not applicable.

5.6.4 Spurious emission band UE co-existence

There is only single UL in uplink so this requirement specified in clause 6.5.3.2 from 38.101-1 is applicable.

Table 5.6.4-1 summarizes frequency ranges where harmonics and/or harmonics mixing occur for CA\_n1\_SUL\_n78-n84.

**Table 5.6.4-1: Impact of UL/DL Harmonic/Harmonic mixing**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  | **2nd Harmonic** | | **3rd Harmonic** | | **4th Harmonic** | |
| **Band** | | **Low Band Edge** | High Band Edge | Low Band Edge | High Band Edge | Low Band Edge | High Band Edge | Low Band Edge | High Band Edge |
| n1 | DL frequency range | 2110 | 2170 | 4220 | 4340 | 6330 | 6510 | 8440 | 8680 |
| n78 | UL/DL frequency range | 3300 | 3800 | 6600 | 7600 | 9900 | 11400 | 13200 | 15200 |
| n84 | UL frequency range | 1920 | 1980 | 3840 | 3960 | 5760 | 5940 | 7680 | 7920 |

There is no harmonic/harmonic mixing issue for this band combination.

5.6.5 REFSENS requirements

For SUL operation with CA, the reference receive sensitivity (REFSENS) requirement for downlink bands specified in clause 7.3A.2 from TS 38.101-1 shall be met when supplementary uplink configuration for reference sensitivity are specified as below.

Table 5.6.5-1: Supplementary uplink configuration for reference sensitivity

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | NR Band / SCS of SUL band / Channel bandwidth of the DL band / NRB | | | | | | | | | | | | | | |
| DL band | SUL band | SCS of SUL band  (kHz) | 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 |
| n1 | n841 | 15 | 25 | 50 | 75 | 100 | 128 | 128 | 128 | 128 |  |  |  |  |  |
| n78 | n84 | 15 |  | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| NOTE 1: The Tx-Rx carrier center frequency separation between SUL band and DL band is the same as the Tx-Rx carrier center frequency separation of DL band specified in table 5.4.4-1 from TS 38.101-1. The channel bandwidth of SUL band is the same as DL band. | | | | | | | | | | | | | | | |

5.6.6 ∆TIB and ∆RIB values

For CA\_n1\_SUL\_n78-n84, the ΔTIB,c and ΔRIB,c values are given in the tables below.

**Table 5.6.6-1: ΔTIB,c**

| SUL Band combination | NR Band | ΔTIB,c [dB] |
| --- | --- | --- |
| CA\_n1\_SUL\_n78-n84 | n1 | 0.6 |
| n78 | 0.8 |
| n84 | 0.6 |

**Table 5.6.6-2: ΔRIB,c**

| SUL Band combination | NR Band | ΔRIB,c [dB] |
| --- | --- | --- |
| CA\_n1\_SUL\_n78-n84 | n1 | 0.2 |
| n78 | 0.5 |

5.7 CA\_n41A\_SUL\_n79A-n80A

5.7.1 Operating bands

**Table 5.7.1-1: SUL band combination**

|  |  |
| --- | --- |
| NR Band combination for SUL | NR Band  (Table 5.2-1) |
| CA\_n41\_SUL\_n79-n80 | n41, n79, n80 |
| NOTE 1: If a UE is configured with both NR UL and NR SUL carriers in a cell, the switching time between NR UL carrier and NR SUL carrier is 0 us.  NOTE 2: For UE supporting SUL band combination simultaneous Rx/Tx capability is mandatory. | |

5.7.2 Channel bandwidths per operating band

**Table 5.7.2-1: Supported bandwidths per SUL band combination**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **SUL band combination with CA** | **UL configuration** | **NR Band** | **Subcarrier spacing**  **(kHz)** | **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** | **Bandwidth combination set** |
| CA\_n41A\_SUL\_n79A-n80A | SUL\_n79A-n80A | n41 | 15 |  | Yes | Yes | Yes |  | Yes | Yes | Yes |  |  |  |  |  | 0 |
| 30 |  | Yes | Yes | Yes |  | Yes | Yes | Yes | Yes |  | Yes | Yes | Yes |
| 60 |  | Yes | Yes | Yes |  | Yes | Yes | Yes | Yes |  | Yes | Yes | Yes |
| n79 | 15 |  |  |  |  |  |  | Yes | Yes |  |  |  |  |  |
| 30 |  |  |  |  |  |  | Yes | Yes | Yes |  | Yes |  | Yes |
| 60 |  |  |  |  |  |  | Yes | Yes | Yes |  | Yes |  | Yes |
| n80 | 15 | Yes | Yes | Yes | Yes | Yes | Yes | Yes |  |  |  |  |  |  |
| 30 |  | Yes | Yes | Yes | Yes | Yes | Yes |  |  |  |  |  |  |
| 60 |  | Yes | Yes | Yes | Yes | Yes | Yes |  |  |  |  |  |  |

5.7.3 Maximum output power

There is only single UL in uplink so this requirement is not applicable.

5.7.4 Spurious emission band UE co-existence

There is only single UL in uplink so this requirement specified in clause 6.5.3.2 from 38.101-1 is applicable.

Table 5.7.4-1 summarizes frequency ranges where harmonics and/or harmonics mixing occur for CA\_n41\_SUL\_n79-n80.

**Table 5.7.4-1: Impact of UL/DL Harmonic/Harmonic mixing**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  | **2nd Harmonic** | | **3rd Harmonic** | | **4th Harmonic** | |
| **Band** | | **Low Band Edge** | High Band Edge | Low Band Edge | High Band Edge | Low Band Edge | High Band Edge | Low Band Edge | High Band Edge |
| n41 | DL frequency range | 2490 | 2690 | 4992 | 5380 | 7488 | 8070 | 9984 | 10760 |
| n79 | UL/DL frequency range | 4400 | 5000 | 8800 | 10000 | 13200 | 15000 | 17600 | 20000 |
| n80 | UL frequency range | 1710 | 1785 | 3420 | 3570 | 5130 | 5355 | 6840 | 7140 |

There is no harmonic/harmonic mixing issue for this combination. The MSD due to cross band isolation between band n80 and n41 has been specified into the 38.101-1

5.7.5 REFSENS requirements

For SUL operation with CA, the reference receive sensitivity (REFSENS) requirement for downlink bands specified in clause 7.3A.2 from TS 38.101-1 shall be met when supplementary uplink configuration for reference sensitivity are specified as below.

Table 5.7.5-1: Supplementary uplink configuration for reference sensitivity

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | NR Band / SCS of SUL band / Channel bandwidth of the DL band / NRB | | | | | | | | | | | | | | |
| DL band | SUL band | SCS of SUL band  (kHz) | 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 |
| n41 | n80 | 15 |  | 160 | 160 | 160 |  | 160 | 160 | 160 | 160 |  | 160 | 160 | 160 |
| n79 | n80 | 15 |  |  |  |  |  |  | 160 | 160 | 160 | 160 | 160 | 160 | 160 |
|  | | | | | | | | | | | | | | | |

5.7.6 ∆TIB and ∆RIB values

For CA\_n41\_SUL\_n79-n80, the ΔTIB,c and ΔRIB,c values are given in the tables below.

**Table 5.7.6-1: ΔTIB,c**

| SUL Band combination | NR Band | ΔTIB,c [dB] |
| --- | --- | --- |
| CA\_n41\_SUL\_n79-n80 | n41 | 0.31 |
| 0.82 |
| n79 | 0.8 |
| n80 | 0.3 |
| NOTE 1: The requirement is applied for UE transmitting on the frequency range of 2515-2690 MHz.  NOTE 2: The requirement is applied for UE transmitting on the frequency range of 2496-2515 MHz. | | |

**Table 5.7.6-2: ΔRIB,c**

| SUL Band combination | NR Band | ΔRIB,c [dB] |
| --- | --- | --- |
| CA\_n41\_SUL\_n79-n80 | n41 | 0.5 |
| n79 | 0.5 |

5.8 CA\_n79A\_SUL\_n41A-n80A

5.8.1 Operating bands

**Table 5.8.1-1: SUL band combination**

|  |  |
| --- | --- |
| NR Band combination for SUL | NR Band  (Table 5.2-1) |
| CA\_n79\_SUL\_n41-n80 | n41, n79, n80 |
| NOTE 1: If a UE is configured with both NR UL and NR SUL carriers in a cell, the switching time between NR UL carrier and NR SUL carrier is 0 us.  NOTE 2: For UE supporting SUL band combination simultaneous Rx/Tx capability is mandatory. | |

5.8.2 Channel bandwidths per operating band

**Table 5.8.2-1: Supported bandwidths per SUL band combination**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **SUL band combination with CA** | **UL configuration** | **NR Band** | **Subcarrier spacing**  **(kHz)** | **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** | **Bandwidth combination set** |
| CA\_n79A\_SUL\_n41A-n80A | SUL\_n41A-n80A | n41 | 15 |  | Yes | Yes | Yes |  | Yes | Yes | Yes |  |  |  |  |  | 0 |
| 30 |  | Yes | Yes | Yes |  | Yes | Yes | Yes | Yes |  | Yes | Yes | Yes |
| 60 |  | Yes | Yes | Yes |  | Yes | Yes | Yes | Yes |  | Yes | Yes | Yes |
| n79 | 15 |  |  |  |  |  |  | Yes | Yes |  |  |  |  |  |
| 30 |  |  |  |  |  |  | Yes | Yes | Yes |  | Yes |  | Yes |
| 60 |  |  |  |  |  |  | Yes | Yes | Yes |  | Yes |  | Yes |
| n80 | 15 | Yes | Yes | Yes | Yes | Yes | Yes | Yes |  |  |  |  |  |  |
| 30 |  | Yes | Yes | Yes | Yes | Yes | Yes |  |  |  |  |  |  |
| 60 |  | Yes | Yes | Yes | Yes | Yes | Yes |  |  |  |  |  |  |

5.8.3 Maximum output power

There is only single UL in uplink so this requirement is not applicable.

5.8.4 Spurious emission band UE co-existence

There is only single UL in uplink so this requirement specified in clause 6.5.3.2 from 38.101-1 is applicable.

Table 5.8.4-1 summarizes frequency ranges where harmonics and/or harmonics mixing occur for CA\_n79\_SUL\_n41-n80.

**Table 5.8.4-1: Impact of UL/DL Harmonic/Harmonic mixing**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  | **2nd Harmonic** | | **3rd Harmonic** | | **4th Harmonic** | |
| **Band** | | **Low Band Edge** | High Band Edge | Low Band Edge | High Band Edge | Low Band Edge | High Band Edge | Low Band Edge | High Band Edge |
| n41 | DL frequency range | 2490 | 2690 | 4992 | 5380 | 7488 | 8070 | 9984 | 10760 |
| n79 | UL/DL frequency range | 4400 | 5000 | 8800 | 10000 | 13200 | 15000 | 17600 | 20000 |
| n80 | UL frequency range | 1710 | 1785 | 3420 | 3570 | 5130 | 5355 | 6840 | 7140 |

There is no harmonic/harmonic mixing issue for this combination. The MSD due to cross band isolation between band n80 and n41 has been specified into the 38.101-1

5.8.5 REFSENS requirements

For SUL operation with CA, the reference receive sensitivity (REFSENS) requirement for downlink bands specified in clause 7.3A.2 from TS 38.101-1 shall be met when supplementary uplink configuration for reference sensitivity are specified as below.

Table 5.8.5-1: Supplementary uplink configuration for reference sensitivity

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | NR Band / SCS of SUL band / Channel bandwidth of the DL band / NRB | | | | | | | | | | | | | | |
| DL band | SUL band | SCS of SUL band  (kHz) | 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 |
| n41 | n80 | 15 |  | 160 | 160 | 160 |  | 160 | 160 | 160 | 160 |  | 160 | 160 | 160 |
| n79 | n80 | 15 |  |  |  |  |  |  | 160 | 160 | 160 | 160 | 160 | 160 | 160 |
|  | | | | | | | | | | | | | | | |

5.8.6 ∆TIB and ∆RIB values

For CA\_n79\_SUL\_n41-n80, the ΔTIB,c and ΔRIB,c values are given in the tables below.

**Table 5.8.6-1: ΔTIB,c**

| SUL Band combination | NR Band | ΔTIB,c [dB] |
| --- | --- | --- |
| CA\_n79\_SUL\_n41-n80 | n41 | 0.31 |
| 0.82 |
| n79 | 0.8 |
| n80 | 0.3 |
| NOTE 1: The requirement is applied for UE transmitting on the frequency range of 2515-2690 MHz.  NOTE 2: The requirement is applied for UE transmitting on the frequency range of 2496-2515 MHz. | | |

**Table 5.8.6-2: ΔRIB,c**

| SUL Band combination | NR Band | ΔRIB,c [dB] |
| --- | --- | --- |
| CA\_n79\_SUL\_n41-n80 | n41 | 0.5 |
| n79 | 0.5 |

5.9 CA\_n3\_SUL\_n78-n80

5.9.1 Operating bands

**Table 5.9.1-1: SUL band combination**

|  |  |
| --- | --- |
| NR Band combination for SUL | NR Band  (Table 5.2-1) |
| CA\_n3\_SUL\_n78-n80 | n3, n78, n80 |
| NOTE 1: If a UE is configured with both NR UL and NR SUL carriers in a cell, the switching time between NR UL carrier and NR SUL carrier is 0 us.  NOTE 2: For UE supporting SUL band combination simultaneous Rx/Tx capability is mandatory. | |

5.9.2 Channel bandwidths per operating band

**Table 5.9.2-1: Supported bandwidths per SUL band combination**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **SUL band combination with CA** | **UL configuration** | **NR Band** | **Subcarrier spacing**  **(kHz)** | **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** | **Bandwidth combination set** |
| CA\_n3A\_SUL\_n78A-n80A | SUL\_n78A-n80A | n3 | 15 | Yes | Yes | Yes | Yes | Yes | Yes | Yes |  |  |  |  |  |  | 0 |
| 30 |  | Yes | Yes | Yes | Yes | Yes | Yes |  |  |  |  |  |  |
| 60 |  | Yes | Yes | Yes | Yes | Yes | Yes |  |  |  |  |  |  |
| n78 | 15 |  | Yes | Yes | Yes | Yes | Yes | Yes | Yes |  |  |  |  |  |
| 30 |  | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| 60 |  | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| n80 | 15 | Yes | Yes | Yes | Yes | Yes | Yes | Yes |  |  |  |  |  |  |
| 30 |  | Yes | Yes | Yes | Yes | Yes | Yes |  |  |  |  |  |  |
| 60 |  | Yes | Yes | Yes | Yes | Yes | Yes |  |  |  |  |  |  |
| CA\_n3A\_SUL\_n78C-n80A | SUL\_n78A-n80A | n3 | 15 | Yes | Yes | Yes | Yes | Yes | Yes | Yes |  |  |  |  |  |  | 0 |
| 30 |  | Yes | Yes | Yes | Yes | Yes | Yes |  |  |  |  |  |  |
| 60 |  | Yes | Yes | Yes | Yes | Yes | Yes |  |  |  |  |  |  |
| n78 | See CA\_n78C Bandwidth Combination Set 1 in Table 5.5A.1-1 | | | | | | | | | | | | | |
| n80 | 15 | Yes | Yes | Yes | Yes | Yes | Yes | Yes |  |  |  |  |  |  |
| 30 |  | Yes | Yes | Yes | Yes | Yes | Yes |  |  |  |  |  |  |
| 60 |  | Yes | Yes | Yes | Yes | Yes | Yes |  |  |  |  |  |  |

5.9.3 Maximum output power

There is only single UL in uplink so the requirement for each band in clause 6.2.1 from 38.101-1 is applicable.

5.9.4 Spurious emission band UE co-existence

There is only single UL in uplink so this requirement specified in clause 6.5.3.2 from 38.101-1 is applicable.

Table 5.9.4-1 summarizes frequency ranges where harmonics and/or harmonics mixing occur for CA\_n3\_SUL\_n78-n80.

**Table 5.9.4-1: Impact of UL/DL Harmonic/Harmonic mixing**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  | **2nd Harmonic** | | **3rd Harmonic** | | **4th Harmonic** | |
| **Band** | | **Low Band Edge** | High Band Edge | Low Band Edge | High Band Edge | Low Band Edge | High Band Edge | Low Band Edge | High Band Edge |
| n3 | DL frequency range | 1805 | 1880 | 3610 | 3760 | 5415 | 5640 | 7220 | 7520 |
| n78 | UL/DL frequency range | 3300 | 3800 | 6600 | 7600 | 9900 | 11400 | 13200 | 15200 |
| n80 | UL frequency range | 1710 | 1785 | 3420 | 3570 | 5130 | 5355 | 6840 | 7140 |

The 2nd harmonic interference of band n80 may fall into the Rx band n78. However, the corresponding MSD has been specified in the spec.

5.9.5 REFSENS requirements

For SUL operation with CA, the reference receive sensitivity (REFSENS) requirement for downlink bands specified in clause 7.3A.2 from TS 38.101-1 shall be met when supplementary uplink configuration for reference sensitivity are specified as below.

Table 5.9.5-1: Supplementary uplink configuration for reference sensitivity

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | NR Band / SCS of SUL band / Channel bandwidth of the DL band / NRB | | | | | | | | | | | | | | |
| DL band | SUL band | SCS of SUL band  (kHz) | 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 |
| n3 | n801 | 15 | 25 | 50 | 50 | 50 | 50 | 50 | 50 |  |  |  |  |  |  |
| n78 | n80 | 15 |  | 160 | 160 | 160 | 160 | 160 | 160 | 160 | 160 | 160 | 160 | 160 | 160 |
| NOTE 1: The Tx-Rx carrier center frequency separation between SUL band and DL band is the same as the Tx-Rx carrier center frequency separation of DL band specified in table 5.4.4-1 from TS 38.101-1. The channel bandwidth of SUL band is the same as DL band. | | | | | | | | | | | | | | | |

The harmonic exception between band n80 and n78 is shown below.

Table 5.9.5-2: Reference sensitivity for SUL operation (exceptions due to harmonic issue)

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| NR Band / Channel bandwidth of the high band | | | | | | | | | | | | | | |
| UL band | DL band | **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 |
| dB | dB | dB | dB | dB | dB | dB | dB | dB | dB | dB | dB | dB |
| n80 | n781,2 |  | 23.9 | 22.1 | 20.9 | 20.1 | 19.3 | 17.9 | 16.8 | 16.0 | 15.5 | 14.8 | 14.3 | 13.8 |
| n783 |  | 1.1 | 0.8 | 0.3 |  |  |  |  |  |  |  |  |  |
| NOTE 1: These requirements apply when there is at least one individual RE within the uplink transmission bandwidth of the aggressor (lower) band for which the 2nd transmitter harmonic is within the downlink transmission bandwidth of a victim (higher) band and a range ∆FHD above and below the edge of this downlink transmission bandwidth. The value ∆FHD depends on the band combination: ∆FHD = 10 MHz for SUL\_n78-n80, SUL\_n78-n86.  NOTE 2: The requirements should be verified for UL EARFCN of the aggressor (lower) band (superscript LB) such that in MHz and  with carrier frequency in the victim (higher) band in MHz and the channel bandwidth configured in the lower band.  NOTE 3: The requirements are only applicable to channel bandwidths no larger than 20 MHz and with a carrier frequency at  MHz offset from  in the victim (higher band) with , whereandare the channel bandwidths configured in the aggressor (lower) and victim (higher) bands in MHz, respectively. | | | | | | | | | | | | | | |

Table 5.9.5-3: Supplementary uplink configuration (exceptions due to harmonic issue)

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| NR Band / Channel bandwidth of the high band | | | | | | | | | | | | | | |
| UL band | DL band | 5 MHz (NRB) | 10 MHz (NRB) | 15 MHz (NRB) | 20 MHz (NRB) | 25 MHz (NRB) | 30 MHz (NRB) | 40 MHz (NRB) | 50 MHz (NRB) | 60 MHz (NRB) | 70 MHz (NRB) | 80 MHz (NRB) | 90 MHz (NRB) | 100 MHz (NRB) |
| n80 | n78 |  | 25 | 36 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 |
| NOTE 1: 15 kHz SCS is assumed for UL band.  NOTE 2: The UL configuration applies regardless of the channel bandwidth of the low band  NOTE 3: Unless stated otherwise, UL resource blocks shall be centered within the transmission bandwidth configuration for the channel bandwidth. | | | | | | | | | | | | | | |

5.9.6 ∆TIB and ∆RIB values

For CA\_n3\_SUL\_n78-n80, the ΔTIB,c and ΔRIB,c values are given in the tables below.

**Table 5.9.6-1: ΔTIB,c**

| SUL Band combination | NR Band | ΔTIB,c [dB] |
| --- | --- | --- |
| CA\_n3\_SUL\_n78-n80 | n3 | 0.6 |
| n78 | 0.8 |
| n80 | 0.6 |

**Table 5.9.6-2: ΔRIB,c**

| SUL Band combination | NR Band | ΔRIB,c [dB] |
| --- | --- | --- |
| CA\_n3\_SUL\_n78-n80 | n3 | 0.2 |
| n78 | 0.5 |

5.10 CA\_n41A\_SUL\_n79A-n83A

5.10.1 Operating bands

**Table 5.10.1-1: SUL band combination**

|  |  |
| --- | --- |
| NR Band combination for SUL | NR Band  (Table 5.2-1) |
| CA\_n41\_SUL\_n79-n83 | n41, n79, n83 |
| NOTE 1: If a UE is configured with both NR UL and NR SUL carriers in a cell, the switching time between NR UL carrier and NR SUL carrier is 0 us.  NOTE 2: For UE supporting SUL band combination simultaneous Rx/Tx capability is mandatory. | |

5.10.2 Channel bandwidths per operating band

**Table 5.10.2-1: Supported bandwidths per SUL band combination**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **SUL band combination with CA** | **UL configuration** | **NR Band** | **Subcarrier spacing**  **(kHz)** | **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** | **Bandwidth combination set** |
| CA\_n41A\_SUL\_n79A-n83A | SUL\_n79A-n83A | n41 | 15 |  | Yes | Yes | Yes |  | Yes | Yes | Yes |  |  |  |  |  | 0 |
| 30 |  | Yes | Yes | Yes |  | Yes | Yes | Yes | Yes |  | Yes | Yes | Yes |
| 60 |  | Yes | Yes | Yes |  | Yes | Yes | Yes | Yes |  | Yes | Yes | Yes |
| n79 | 15 |  |  |  |  |  |  | Yes | Yes |  |  |  |  |  |
| 30 |  |  |  |  |  |  | Yes | Yes | Yes |  | Yes |  | Yes |
| 60 |  |  |  |  |  |  | Yes | Yes | Yes |  | Yes |  | Yes |
| n83 | 15 | Yes | Yes | Yes | Yes |  | Yes |  |  |  |  |  |  |  |
| 30 |  | Yes | Yes | Yes |  | Yes |  |  |  |  |  |  |  |
| 60 |  | Yes | Yes | Yes |  | Yes |  |  |  |  |  |  |  |

5.10.3 Maximum output power

There is only single UL in uplink so the requirement for each band in clause 6.2.1 from 38.101-1 is applicable.

5.10.4 Spurious emission band UE co-existence

There is only single UL in uplink so this requirement specified in clause 6.5.3.2 from 38.101-1 is applicable.

Table 5.10.4-1 summarizes frequency ranges where harmonics and/or harmonics mixing occur for CA\_n41\_SUL\_n79-n83.

**Table 5.10.4-1: Impact of UL/DL Harmonic/Harmonic mixing**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  | **2nd Harmonic** | | **3rd Harmonic** | | **4th Harmonic** | |
| **Band** | | **Low Band Edge** | High Band Edge | Low Band Edge | High Band Edge | Low Band Edge | High Band Edge | Low Band Edge | High Band Edge |
| n41 | DL frequency range | 2490 | 2690 | 4992 | 5380 | 7488 | 8070 | 9984 | 10760 |
| n79 | UL/DL frequency range | 4400 | 5000 | 8800 | 10000 | 13200 | 15000 | 17600 | 20000 |
| n83 | UL frequency range | 703 | 748 | 1406 | 1496 | 2109 | 2244 | 2812 | 2992 |

There is no harmonic/harmonic mixing issue for this combination.

5.10.5 REFSENS requirements

For SUL operation with CA, the reference receive sensitivity (REFSENS) requirement for downlink bands specified in clause 7.3A.2 from TS 38.101-1 shall be met when supplementary uplink configuration for reference sensitivity are specified in 7.3C.2-1 from TS 38.101-1.

5.10.6 ∆TIB and ∆RIB values

For CA\_n41\_SUL\_n79-n83, the ΔTIB,c and ΔRIB,c values are given in the tables below.

**Table 5.10.6-1: ΔTIB,c**

| SUL Band combination | NR Band | ΔTIB,c [dB] |
| --- | --- | --- |
| CA\_n41\_SUL\_n79-n83 | n41 | 0.3 |
| n79 | 0.8 |
| n83 | 0.5 |
|  | | |

**Table 5.10.6-2: ΔRIB,c**

| SUL Band combination | NR Band | ΔRIB,c [dB] |
| --- | --- | --- |
| CA\_n41\_SUL\_n79-n83 | n41 | 0 |
| n79 | 0.5 |

5.11 CA\_n79A\_SUL\_n41A-n83A

5.11.1 Operating bands

**Table 5.11.1-1: SUL band combination**

|  |  |
| --- | --- |
| NR Band combination for SUL | NR Band  (Table 5.2-1) |
| CA\_n79\_SUL\_n41-n83 | n41, n79, n83 |
| NOTE 1: If a UE is configured with both NR UL and NR SUL carriers in a cell, the switching time between NR UL carrier and NR SUL carrier is 0 us.  NOTE 2: For UE supporting SUL band combination simultaneous Rx/Tx capability is mandatory. | |

5.11.2 Channel bandwidths per operating band

**Table 5.11.2-1: Supported bandwidths per SUL band combination**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **SUL band combination with CA** | **UL configuration** | **NR Band** | **Subcarrier spacing**  **(kHz)** | **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** | **Bandwidth combination set** |
| CA\_n79A\_SUL\_n41A-n83A | SUL\_n41A-n83A | n41 | 15 |  | Yes | Yes | Yes |  | Yes | Yes | Yes |  |  |  |  |  | 0 |
| 30 |  | Yes | Yes | Yes |  | Yes | Yes | Yes | Yes |  | Yes | Yes | Yes |
| 60 |  | Yes | Yes | Yes |  | Yes | Yes | Yes | Yes |  | Yes | Yes | Yes |
| n79 | 15 |  |  |  |  |  |  | Yes | Yes |  |  |  |  |  |
| 30 |  |  |  |  |  |  | Yes | Yes | Yes |  | Yes |  | Yes |
| 60 |  |  |  |  |  |  | Yes | Yes | Yes |  | Yes |  | Yes |
| n83 | 15 | Yes | Yes | Yes | Yes |  | Yes |  |  |  |  |  |  |  |
| 30 |  | Yes | Yes | Yes |  | Yes |  |  |  |  |  |  |  |
| 60 |  | Yes | Yes | Yes |  | Yes |  |  |  |  |  |  |  |

5.11.3 Maximum output power

There is only single UL in uplink so the requirement for each band in clause 6.2.1 from 38.101-1 is applicable.

5.11.4 Spurious emission band UE co-existence

There is only single UL in uplink so this requirement specified in clause 6.5.3.2 from 38.101-1 is applicable.

Table 5.11.4-1 summarizes frequency ranges where harmonics and/or harmonics mixing occur for CA\_n79\_SUL\_n41-n83.

**Table 5.11.4-1: Impact of UL/DL Harmonic/Harmonic mixing**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  | **2nd Harmonic** | | **3rd Harmonic** | | **4th Harmonic** | |
| **Band** | | **Low Band Edge** | High Band Edge | Low Band Edge | High Band Edge | Low Band Edge | High Band Edge | Low Band Edge | High Band Edge |
| n41 | UL/DL frequency range | 2496 | 2690 | 4992 | 5380 | 7488 | 8070 | 9984 | 10760 |
| n79 | DL frequency range | 4400 | 5000 | 8800 | 10000 | 13200 | 15000 | 17600 | 20000 |
| n83 | UL frequency range | 703 | 748 | 1406 | 1496 | 2109 | 2244 | 2812 | 2992 |

UL 2nd harmonic may fall into Rx of band n79.

5.11.5 REFSENS requirements

For SUL operation with CA, the reference receive sensitivity (REFSENS) requirement for downlink bands specified in clause 7.3A.2 from TS 38.101-1 shall be met when supplementary uplink configuration for reference sensitivity are specified in 7.3C.2-1 from TS 38.101-1.

UL 2nd harmonic between band n41 and n79 can follow current RAN4’s agreement of the fallback CA\_n41-n79.

5.11.6 ∆TIB and ∆RIB values

For CA\_n79\_SUL\_n41-n83, the ΔTIB,c and ΔRIB,c values are given in the tables below.

**Table 5.11.6-1: ΔTIB,c**

| SUL Band combination | NR Band | ΔTIB,c [dB] |
| --- | --- | --- |
| CA\_n79\_SUL\_n41-n83 | n41 | 0.3 |
| n79 | 0.8 |
| n83 | 0.5 |
|  | | |

**Table 5.11.6-2: ΔRIB,c**

| SUL Band combination | NR Band | ΔRIB,c [dB] |
| --- | --- | --- |
| CA\_n79\_SUL\_n41-n83 | n41 | 0 |
| n79 | 0.5 |

5.12 SUL\_n79A-n97A

5.12.1 Operating bands

**Table 5.12.1-1: SUL band combination**

|  |  |
| --- | --- |
| NR Band combination for SUL | NR Band  (Table 5.2-1) |
| SUL\_n79-n97 | n79, n97 |
| NOTE 1: If a UE is configured with both NR UL and NR SUL carriers in a cell, the switching time between NR UL carrier and NR SUL carrier is 0 us.  NOTE 2: For UE supporting SUL band combination simultaneous Rx/Tx capability is mandatory. | |

5.12.2 Channel bandwidths per operating band

**Table 5.12.2-1: Supported bandwidths per SUL band combination**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **SUL band combination with CA** | **UL configuration** | **NR Band** | **Subcarrier spacing**  **(kHz)** | **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** | **Bandwidth combination set** |
| SUL\_n79A-n97A | SUL\_n79A-n97A | n79 | 15 |  |  |  |  |  |  | Yes | Yes |  |  |  |  |  | 0 |
| 30 |  |  |  |  |  |  | Yes | Yes | Yes |  | Yes |  | Yes |
| 60 |  |  |  |  |  |  | Yes | Yes | Yes |  | Yes |  | Yes |
| n97 | 15 | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |  |  |  |  |  |
| 30 |  | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |  | Yes |  |  |
| 60 |  | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |  | Yes |  |  |

5.12.3 Maximum output power

There is only single UL in uplink so the requirement for each band in clause 6.2.1 from 38.101-1 is applicable.

5.12.4 Spurious emission band UE co-existence

There is only single UL in uplink so this requirement specified in clause 6.5.3.2 from 38.101-1 is applicable.

Table 5.12.4-1 summarizes frequency ranges where harmonics and/or harmonics mixing occur for SUL\_n79-n97.

**Table 5.12.4-1: Impact of UL/DL Harmonic/Harmonic mixing**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  | **2nd Harmonic** | | **3rd Harmonic** | | **4th Harmonic** | |
| **Band** | | **Low Band Edge** | High Band Edge | Low Band Edge | High Band Edge | Low Band Edge | High Band Edge | Low Band Edge | High Band Edge |
| n79 | UL/DL frequency range | 4400 | 5000 | 8800 | 10000 | 13200 | 15000 | 17600 | 20000 |
| n97 | UL frequency range | 2300 | 2400 | 4600 | 4800 | 6900 | 7200 | 9200 | 9600 |

The 2nd harmonic interference of band n97 may fall into Rx band of n79.

5.12.5 REFSENS requirements

For SUL operation with CA, the reference receive sensitivity (REFSENS) requirement for downlink bands specified in clause 7.3A.2 from TS 38.101-1 shall be met when supplementary uplink configuration for reference sensitivity are specified as below.

Table 5.12.5-1: Supplementary uplink configuration for reference sensitivity

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | NR Band / SCS of SUL band / Channel bandwidth of the DL band / NRB | | | | | | | | | | | | | | |
| DL band | SUL band | SCS of SUL band  (kHz) | 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 |
| n79 | n97 | 15 |  |  |  |  |  |  | 270 | 270 | 270 |  | 270 |  | 270 |
|  | | | | | | | | | | | | | | | |

The MSD exception for SUL\_n79-n97 are specified below.

Table 5.12.5-2: Reference sensitivity for SUL operation (exceptions due to harmonic issue)

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| UL band | | DL band | 5 MHz  (dB) | 10 MHz  (dB) | 15 MHz  (dB) | 20 MHz  (dB) | 25 MHz  (dB) | 30MHz  (dB) | 40 MHz  (dB) | 50 MHz  (dB) | 60 MHz  (dB) | 80 MHz  (dB) | 90 MHz  (dB) | 100 MHz  (dB) |
| n97 | | n791,2 |  |  |  |  |  |  | 29.4 | 28.4 | 27.6 | 26.3 |  | 25.3 |
| NOTE 1: These requirements apply when there is at least one individual RE within the uplink transmission bandwidth of the aggressor (lower) band for which the 2nd transmitter harmonic is within the downlink transmission bandwidth of a victim (higher) band and a range ∆FHD above and below the edge of this downlink transmission bandwidth. The value ∆FHD depends on the band combination: ∆FHD = 10 MHz for SUL\_n78-n80, SUL\_n78-n86.  NOTE 2: The requirements should be verified for UL EARFCN of the aggressor (lower) band (superscript LB) such that in MHz and  with carrier frequency in the victim (higher) band in MHz and the channel bandwidth configured in the lower band. | | | | | | | | | | | | | | |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

Table 5.12.5-3: Supplementary uplink configuration (exceptions due to harmonic issue)

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| UL band | DL band | 5 MHz  (NRB) | 10 MHz  (NRB) | 15 MHz  (NRB) | 20 MHz  (NRB) | 25 MHz  (NRB) | 30MHz  (NRB) | 40 MHz  (NRB) | 50 MHz  (NRB) | 60 MHz  (NRB) | 80 MHz  (NRB) | 90 MHz  (NRB) | 100 MHz  (NRB) |
| n97 | n79 |  |  |  |  |  |  | 100 | 135 | 160 | 216 |  | 270 |
| NOTE 1:   15 kHz SCS is assumed for UL band.  NOTE 2: The UL configuration applies regardless of the channel bandwidth of the low band  NOTE 3: Unless stated otherwise, UL resource blocks shall be centered within the transmission bandwidth configuration for the channel bandwidth. | | | | | | | | | | | | | |

5.12.6 ∆TIB and ∆RIB values

For SUL\_n79-n97, the ΔTIB,c and ΔRIB,c values are given in the tables below.

**Table 5.12.6-1: ΔTIB,c**

| SUL Band combination | NR Band | ΔTIB,c [dB] |
| --- | --- | --- |
| SUL\_n79-n97 | n79 | 0.8 |
| n97 | 0.3 |

**Table 5.12.6-2: ΔRIB,c**

| SUL Band combination | NR Band | ΔRIB,c [dB] |
| --- | --- | --- |
| SUL\_n79-n97 | n79 | 0.5 |

5.13 SUL\_n41A-n98A

5.13.1 Operating bands

**Table 5.13.1-1: SUL band combination**

|  |  |
| --- | --- |
| NR Band combination for SUL | NR Band  (Table 5.2-1) |
| SUL\_n41-n982 | n41, n98 |
| NOTE 1: If a UE is configured with both NR UL and NR SUL carriers in a cell, the switching time between NR UL carrier and NR SUL carrier is 0 us.  NOTE 2: For UE supporting SUL band combination simultaneous Rx/Tx capability is mandatory. | |

5.13.2 Channel bandwidths per operating band

**Table 5.13.2-1: Supported bandwidths per SUL band combination**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **SUL band combination with CA** | **UL configuration** | **NR Band** | **Subcarrier spacing**  **(kHz)** | **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** | **Bandwidth combination set** |
| SUL\_n41A-n98A | SUL\_n41A-n98A | n41 | 15 |  | Yes | Yes | Yes |  | Yes | Yes | Yes |  |  |  |  |  | 0 |
| 30 |  | Yes | Yes | Yes |  | Yes | Yes | Yes | Yes |  | Yes | Yes | Yes |
| 60 |  | Yes | Yes | Yes |  | Yes | Yes | Yes | Yes |  | Yes | Yes | Yes |
| n98 | 15 | Yes | Yes | Yes | Yes | Yes | Yes | Yes |  |  |  |  |  |  |
| 30 |  | Yes | Yes | Yes | Yes | Yes | Yes |  |  |  |  |  |  |
| 60 |  | Yes | Yes | Yes | Yes | Yes | Yes |  |  |  |  |  |  |

5.13.3 Maximum output power

There is only single UL in uplink so the requirement for each band in clause 6.2.1 from 38.101-1 is applicable.

5.13.4 Spurious emission band UE co-existence

There is only single UL in uplink so this requirement specified in clause 6.5.3.2 from 38.101-1 is applicable.

Table 5.13.4-1 summarizes frequency ranges where harmonics and/or harmonics mixing occur for SUL\_n41-n98.

**Table 5.13.4-1: Impact of UL/DL Harmonic/Harmonic mixing**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  | **2nd Harmonic** | | **3rd Harmonic** | | **4th Harmonic** | |
| **Band** | | **Low Band Edge** | High Band Edge | Low Band Edge | High Band Edge | Low Band Edge | High Band Edge | Low Band Edge | High Band Edge |
| n41 | UL/DL frequency range | 2496 | 2690 | 4992 | 5380 | 7488 | 8070 | 9984 | 10760 |
| n98 | UL frequency range | 1880 | 1920 | 3760 | 3840 | 5640 | 5760 | 7520 | 7680 |

There is no harmonic/harmonic mixing issue for this band combination.

5.13.5 REFSENS requirements

For SUL operation, the reference receive sensitivity (REFSENS) requirement for downlink bands specified in clause 7.3A.2 from TS 38.101-1 shall be met when supplementary uplink configuration for reference sensitivity are specified as below.

Table 5.13.5-1: Supplementary uplink configuration for reference sensitivity

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | NR Band / SCS of SUL band / Channel bandwidth of the DL band / NRB | | | | | | | | | | | | | | |
| DL band | SUL band | SCS of SUL band  (kHz) | 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 |
| n41 | n98 | 15 |  | 216 | 216 | 216 |  | 216 | 216 | 216 | 216 |  | 216 | 216 | 216 |
|  | | | | | | | | | | | | | | | |

5.13.6 ∆TIB and ∆RIB values

For SUL\_n41-n98, the ΔTIB,c and ΔRIB,c values are given in the tables below.

**Table 5.13.6-1: ΔTIB,c**

| SUL Band combination | NR Band | ΔTIB,c [dB] |
| --- | --- | --- |
| SUL\_n41-n98 | n41 | 0.5 |
| n98 | 0.5 |

**Table 5.13.6-2: ΔRIB,c**

| SUL Band combination | NR Band | ΔRIB,c [dB] |
| --- | --- | --- |
| SUL\_n41-n98 | n41 | 0.2 |

5.14 SUL\_n79A-n98A

5.14.1 Operating bands

**Table 5.14.1-1: SUL band combination**

|  |  |
| --- | --- |
| NR Band combination for SUL | NR Band  (Table 5.2-1) |
| SUL\_n79-n98 | n79, n98 |
| NOTE 1: If a UE is configured with both NR UL and NR SUL carriers in a cell, the switching time between NR UL carrier and NR SUL carrier is 0 us.  NOTE 2: For UE supporting SUL band combination simultaneous Rx/Tx capability is mandatory. | |

5.14.2 Channel bandwidths per operating band

**Table 5.14.2-1: Supported bandwidths per SUL band combination**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **SUL band combination with CA** | **UL configuration** | **NR Band** | **Subcarrier spacing**  **(kHz)** | **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** | **Bandwidth combination set** |
| SUL\_n79A-n98A | SUL\_n79A-n98A | n79 | 15 |  |  |  |  |  |  | Yes | Yes |  |  |  |  |  | 0 |
| 30 |  |  |  |  |  |  | Yes | Yes | Yes |  | Yes |  | Yes |
| 60 |  |  |  |  |  |  | Yes | Yes | Yes |  | Yes |  | Yes |
| n98 | 15 | Yes | Yes | Yes | Yes | Yes | Yes | Yes |  |  |  |  |  |  |
| 30 |  | Yes | Yes | Yes | Yes | Yes | Yes |  |  |  |  |  |  |
| 60 |  | Yes | Yes | Yes | Yes | Yes | Yes |  |  |  |  |  |  |

5.14.3 Maximum output power

There is only single UL in uplink so the requirement for each band in clause 6.2.1 from 38.101-1 is applicable.

5.14.4 Spurious emission band UE co-existence

There is only single UL in uplink so this requirement specified in clause 6.5.3.2 from 38.101-1 is applicable.

Table 5.14.4-1 summarizes frequency ranges where harmonics and/or harmonics mixing occur for SUL\_n79-n98.

**Table 5.14.4-1: Impact of UL/DL Harmonic/Harmonic mixing**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  | **2nd Harmonic** | | **3rd Harmonic** | | **4th Harmonic** | |
| **Band** | | **Low Band Edge** | High Band Edge | Low Band Edge | High Band Edge | Low Band Edge | High Band Edge | Low Band Edge | High Band Edge |
| n79 | UL/DL frequency range | 4400 | 5000 | 8800 | 10000 | 13200 | 15000 | 17600 | 20000 |
| n98 | UL frequency range | 1880 | 1920 | 3760 | 3840 | 5640 | 5760 | 7520 | 7680 |

There is no harmonic or harmonic mixing issue.

5.14.5 REFSENS requirements

For SUL operation with CA, the reference receive sensitivity (REFSENS) requirement for downlink bands specified in clause 7.3A.2 from TS 38.101-1 shall be met when supplementary uplink configuration for reference sensitivity are specified as below.

Table 5.14.5-1: Supplementary uplink configuration for reference sensitivity

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | NR Band / SCS of SUL band / Channel bandwidth of the DL band / NRB | | | | | | | | | | | | | | |
| DL band | SUL band | SCS of SUL band  (kHz) | 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 |
| n79 | n98 | 15 |  |  |  |  |  |  | 216 | 216 | 216 |  | 216 |  | 216 |
|  | | | | | | | | | | | | | | | |

5.14.6 ∆TIB and ∆RIB values

For SUL\_n79-n98, the ΔTIB,c and ΔRIB,c values are given in the tables below.

**Table 5.14.6-1: ΔTIB,c**

| SUL Band combination | NR Band | ΔTIB,c [dB] |
| --- | --- | --- |
| SUL\_n79-n98 | n79 | 0.8 |
| n98 | 0.3 |

**Table 5.14.6-2: ΔRIB,c**

| SUL Band combination | NR Band | ΔRIB,c [dB] |
| --- | --- | --- |
| SUL\_n79-n98 | n79 | 0.5 |

5.15 SUL\_n41-n99

5.15.1 Operating bands

**Table 5.15.1-1: SUL band combination**

|  |  |
| --- | --- |
| NR Band combination for SUL | NR Band  (Table 5.2-1) |
| SUL\_n41-n992 | n41, n99 |
| NOTE 1: If a UE is configured with both NR UL and NR SUL carriers in a cell, the switching time between NR UL carrier and NR SUL carrier is 0 us.  NOTE 2: For UE supporting SUL band combination simultaneous Rx/Tx capability is mandatory. | |

**Table 5.15.1-2: Operating SUL band combination with intra-band non-contiguous CA in FR1**

|  |  |
| --- | --- |
| NR Band combination for SUL | NR Band  (Table 5.2-1) |
| SUL\_n41(\*)-n992 | n41, n99 |
| NOTE 1: If a UE is configured with both NR UL and NR SUL carriers in a cell, the switching time between NR UL carrier and NR SUL carrier is 0 us.  NOTE 2: For UE supporting SUL band combination simultaneous Rx/Tx capability is mandatory.  NOTE 3: The notation CA\_nX(\*) in this table indicates intra-band non-contiguous CA for band nX. The configurations for each band are in table 5.5C-2. | |

5.15.2 Channel bandwidths per operating band

**Table 5.15.2-1: Supported bandwidths per SUL band combination**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **SUL band combination with CA** | **UL configuration** | **NR Band** | **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** | **Bandwidth combination set** |
| SUL\_n41A-n99A | SUL\_n41A-n99A | n41 |  | 10 | 15 | 20 |  | 30 | 40 | 50 | 60 |  | 80 | 90 | 100 | 0 |
| n99 | 5 | 10 |  |  |  |  |  |  |  |  |  |  |  |

**Table 5.15.2-2: Supported channel bandwidths per SUL band combination with intra-band non-contiguous CA**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **SUL band combination with intra-band non-contiguous CA** | **SUL configuration** | **NR Band** | **Channel bandwidth (MHz) (NOTE 1)** | | | | | | | | | | | | **Bandwidth combination set** |
|  |  |  | **5** | **10** | **15** | **20** | **25** | **30** | **40** | **50** | **60** | **80** | **90** | **100** |  |
| SUL\_n41(2A)-n99A | SUL\_n41A-n99A | n41 | See CA\_n41(2A) Bandwidth Combination Set 0 in Table 5.5A.2-1 | | | | | | | | | | | | 0 |
|  |  | n99 | 5 | 10 |  |  |  |  |  |  |  |  |  |  |  |
| NOTE 1: The SCS of each channel bandwidth for NR band refers to Table 5.3.5-1. | | | | | | | | | | | | | | | |

5.15.3 Maximum output power

There is only single UL in uplink so the requirement for each band in clause 6.2.1 from 38.101-1 is applicable.

5.15.4 Spurious emission band UE co-existence

There is only single UL in uplink so this requirement specified in clause 6.5.3.2 from 38.101-1 is applicable.

5.15.5 REFSENS requirements

For SUL operation with CA, the reference receiver sensitivity (REFSENS) requirement for downlink bands specified in clause 7.3A.2 from TS 38.101-1 shall be met when supplementary uplink configuration for reference sensitivity are specified as below.

Table 5.15.5-1: Supplementary uplink configuration for reference sensitivity

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | NR Band / SCS of SUL band / Channel bandwidth of the DL band / NRB | | | | | | | | | | | | | | |
| DL band | SUL band | SCS of SUL band  (kHz) | 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 |
| n41 | n99 | 15 |  | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 |
|  | | | | | | | | | | | | | | | |

There is no harmonic/harmonic mixing issue for this band combination.

5.15.6 ∆TIB and ∆RIB values

For SUL\_n41-n99, the ΔTIB,c and ΔRIB,c values are given in the tables below according to CA\_n25-n41 relaxation values.

**Table 5.15.6-1: ΔTIB,c**

| Inter-band CA Configuration | NR Band | ΔTIB,c [dB] |
| --- | --- | --- |
| CA\_n41-n99 | n99 | 0.3 |
| n41 | 0.41 |
| 0.92 |
| NOTE 1: The requirement is applied for UE transmitting on the frequency range of 2545-2690MHz.  NOTE 2: The requirement is applied for UE transmitting on the frequency range of 2496-2545MHz. | | |

**Table 5.15.6-2: ΔRIB,c**

| SUL Band combination | NR Band | ΔRIB,c [dB] |
| --- | --- | --- |
| SUL\_n41-n99 | n41 | 0 |

5.16 SUL\_n48-n99

5.16.1 Operating bands

**Table 5.16.1-1: SUL band combination**

|  |  |
| --- | --- |
| NR Band combination for SUL | NR Band  (Table 5.2-1) |
| SUL\_n48-n99 | n48, n99 |
| NOTE 1: If a UE is configured with both NR UL and NR SUL carriers in a cell, the switching time between NR UL carrier and NR SUL carrier is 0 us.  NOTE 2: For UE supporting SUL band combination simultaneous Rx/Tx capability is mandatory. | |

**Table 5.16.1-2: Operating SUL band combination with intra-band non-contiguous CA in FR1**

|  |  |
| --- | --- |
| NR Band combination for SUL | NR Band  (Table 5.2-1) |
| SUL\_n48(\*)-n992 | n48, n99 |
| NOTE 1: If a UE is configured with both NR UL and NR SUL carriers in a cell, the switching time between NR UL carrier and NR SUL carrier is 0 us.  NOTE 2: For UE supporting SUL band combination simultaneous Rx/Tx capability is mandatory.  NOTE 3: The notation CA\_nX(\*) in this table indicates intra-band non-contiguous CA for band nX. The configurations for each band are in table 5.5C-2. | |

5.16.2 Channel bandwidths per operating band

**Table 5.16.2-1: Supported bandwidths per SUL band combination**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **SUL band combination with CA** | **UL configuration** | **NR Band** | **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** | **Bandwidth combination set** |
| SUL\_n48A-n99A | SUL\_n48A-n99A | n48 | 5 | 10 | 15 | 20 |  |  | 40 | 50 | 60 |  | 80 | 90 | 100 | 0 |
| n99 | 5 | 10 |  |  |  |  |  |  |  |  |  |  |  |

**Table 5.16.2-2: Supported channel bandwidths per SUL band combination with intra-band non-contiguous CA**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **SUL band combination with intra-band non-contiguous CA** | **SUL configuration** | **NR Band** | **Channel bandwidth (MHz) (NOTE 1)** | | | | | | | | | | | | **Bandwidth combination set** |
|  |  |  | **5** | **10** | **15** | **20** | **25** | **30** | **40** | **50** | **60** | **80** | **90** | **100** |  |
| SUL\_n48(2A)-n99A | SUL\_n48A-n99A | n48 | See CA\_n48(2A) Bandwidth Combination Set 0 in Table 5.5A.2-1 | | | | | | | | | | | | 0 |
|  |  | n99 | 5 | 10 |  |  |  |  |  |  |  |  |  |  |  |
| NOTE 1: The SCS of each channel bandwidth for NR band refers to Table 5.3.5-1. | | | | | | | | | | | | | | | |

5.16.3 Maximum output power

There is only single UL in uplink so the requirement for each band in clause 6.2.1 from 38.101-1 is applicable.

5.16.4 Spurious emission band UE co-existence

There is only single UL in uplink so this requirement specified in clause 6.5.3.2 from 38.101-1 is applicable.

5.16.5 REFSENS requirements

For SUL operation with CA, the reference receiver sensitivity (REFSENS) requirement for downlink bands specified in clause 7.3A.2 from TS 38.101-1 shall be met when supplementary uplink configuration for reference sensitivity are specified as below.

Table 5.16.5-1: Supplementary uplink configuration for reference sensitivity

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | NR Band / SCS of SUL band / Channel bandwidth of the DL band / NRB | | | | | | | | | | | | | | |
| DL band | SUL band | SCS of SUL band  (kHz) | 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 |
| n48 | n99 | 15 | 25 | 50 | 50 | 50 |  |  | 50 | 50 | 50 | 50 | 50 | 50 | 50 |

There is no harmonic/harmonic mixing issue for this band combination.

5.16.6 ∆TIB and ∆RIB values

For SUL\_n48-n99, the ΔTIB,c and ΔRIB,c values are given in the tables below according to CA\_n48-n66 relaxation values..

**Table 5.16.6-1: ΔTIB,c**

| SUL Band combination | NR Band | ΔTIB,c [dB] |
| --- | --- | --- |
| SUL\_n48-n99 | n48 | 0.6 |
| n99 | 0.8 |

**Table 5.16.6-2: ΔRIB,c**

| SUL Band combination | NR Band | ΔRIB,c [dB] |
| --- | --- | --- |
| SUL\_n48-n99 | n48 | 0.5 |

5.17 SUL\_n77-n99

5.17.1 Operating bands

**Table 5.17.1-1: SUL band combination**

|  |  |
| --- | --- |
| NR Band combination for SUL | NR Band  (Table 5.2-1) |
| SUL\_n77-n99 | n77, n99 |
| NOTE 1: If a UE is configured with both NR UL and NR SUL carriers in a cell, the switching time between NR UL carrier and NR SUL carrier is 0 us.  NOTE 2: For UE supporting SUL band combination simultaneous Rx/Tx capability is mandatory. | |

**Table 5.17.1-2: Operating SUL band combination with intra-band non-contiguous CA in FR1**

|  |  |
| --- | --- |
| NR Band combination for SUL | NR Band  (Table 5.2-1) |
| SUL\_n77(\*)-n992 | n77, n99 |
| NOTE 1: If a UE is configured with both NR UL and NR SUL carriers in a cell, the switching time between NR UL carrier and NR SUL carrier is 0 us.  NOTE 2: For UE supporting SUL band combination simultaneous Rx/Tx capability is mandatory.  NOTE 3: The notation CA\_nX(\*) in this table indicates intra-band non-contiguous CA for band nX. The configurations for each band are in table 5.5C-2. | |

5.17.2 Channel bandwidths per operating band

**Table 5.17.2-1: Supported bandwidths per SUL band combination**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **SUL band combination with CA** | **UL configuration** | **NR Band** | **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** | **Bandwidth combination set** |
| SUL\_n77A-n99A | SUL\_n77A-n99A | n77 |  | 10 | 15 | 20 |  |  | 40 | 50 | 60 |  | 80 | 90 | 100 | 0 |
| n99 | 5 | 10 |  |  |  |  |  |  |  |  |  |  |  |

**Table 5.17.2-2: Supported channel bandwidths per SUL band combination with intra-band non-contiguous CA**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **SUL band combination with intra-band non-contiguous CA** | **SUL configuration** | **NR Band** | **Channel bandwidth (MHz) (NOTE 1)** | | | | | | | | | | | | **Bandwidth combination set** |
|  |  |  | **5** | **10** | **15** | **20** | **25** | **30** | **40** | **50** | **60** | **80** | **90** | **100** |  |
| SUL\_n77(2A)-n99A | SUL\_n77A-n99A | n77 | See CA\_n77(2A) Bandwidth Combination Set 0 in Table 5.5A.2-1 | | | | | | | | | | | | 0 |
|  |  | n99 | 5 | 10 |  |  |  |  |  |  |  |  |  |  |  |
| NOTE 1: The SCS of each channel bandwidth for NR band refers to Table 5.3.5-1. | | | | | | | | | | | | | | | |

5.17.3 Maximum output power

There is only single UL in uplink so the requirement for each band in clause 6.2.1 from 38.101-1 is applicable.

5.17.4 Spurious emission band UE co-existence

There is only single UL in uplink so this requirement specified in clause 6.5.3.2 from 38.101-1 is applicable.

5.17.5 REFSENS requirements

For SUL operation with CA, the reference receiver sensitivity (REFSENS) requirement for downlink bands specified in clause 7.3A.2 from TS 38.101-1 shall be met when supplementary uplink configuration for reference sensitivity are specified as below.

Table 5.17.5-1: Supplementary uplink configuration for reference sensitivity

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | NR Band / SCS of SUL band / Channel bandwidth of the DL band / NRB | | | | | | | | | | | | | | |
| DL band | SUL band | SCS of SUL band  (kHz) | 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 |
| n77 | n99 | 15 |  | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 |

Table 5.17.5-1 summarizes frequency ranges where harmonics and/or harmonics mixing occur for SUL\_n77-n99.

**Table 5.17.5-1: Impact of UL/DL Harmonic/Harmonic mixing**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  | **2nd Harmonic** | | **3rd Harmonic** | | **4th Harmonic** | |
| **Band** | | **Low Band Edge** | High Band Edge | Low Band Edge | High Band Edge | Low Band Edge | High Band Edge | Low Band Edge | High Band Edge |
| n77 | UL/DL frequency range | 3300 | 4200 | 6600 | 8400 | 9900 | 12600 | 13200 | 16800 |
| n99 | UL frequency range | 1626.5 | 1660.5 | 3253 | 3321 | 4879.5 | 4981.5 | 6506 | 6642 |

The 2nd harmonic interference of band n99 may fall into Rx band of n77.

The MSD exception for SUL\_n77-n99 are specified below. MSD values for Band n77 due to 2nd harmonic of Band n99 in SUL\_n99A-n77A are captured in Table 5.17.5-2 according to CA\_n66-n77 values which also had a similar 2nd harmonic of n66 falling in n77 DL frequency range.

Table 5.17.5-2: Reference sensitivity for SUL operation (exceptions due to harmonic issue)

|  | NR Band / Channel bandwidth of the affected DL band / MSD | | | | | | | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| UL band | DL band | 5 MHz  (dB) | 10 MHz  (dB) | 15 MHz  (dB) | 20 MHz  (dB) | 25 MHz  (dB) | 30 MHz (dB) | 40 MHz  (dB) | 50 MHz  (dB) | 60 MHz  (dB) | 70 MHz (dB) | 80 MHz  (dB) | 90 MHz  (dB) | 100 MHz  (dB) |
| n99 | n771, 2 |  | 23.9 | 22.1 | 20.9 | 19.8 | 19.0 | 17.9 | 16.8 | 16.0 | 15.3 | 14.8 | 14.3 | 13.8 |
| n773 |  | 1.1 | 0.8 | 0.3 | 0.1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| NOTE 1: These requirements apply when there is at least one individual RE within the uplink transmission bandwidth of the aggressor (lower) band for which the 2nd transmitter harmonic is within the downlink transmission bandwidth of a victim (higher) band and a range ∆FHD above and below the edge of this downlink transmission bandwidth. The value ∆FHD depends on the band combination: ∆FHD = 10 MHz for CA\_n1-n77, CA\_n2-n78, CA\_n3-n77, CA\_n3-n78, CA\_n2-n48, CA\_n25-n78, CA\_n48-n66, CA\_n66-n78, CA\_n66-n77, n24-n77.  NOTE 2: The requirements should be verified for UL EARFCN or NR ARFCN of the aggressor (lower) band (superscript LB) such that in MHz and  with carrier frequency in the victim (higher) band in MHz and the channel bandwidth configured in the lower band.  NOTE 3: The requirements are only applicable to channel bandwidths no larger than 20 MHz and with a carrier frequency at  MHz offset from  in the victim (higher band) with , whereandare the channel bandwidths configured in the aggressor (lower) and victim (higher) bands in MHz, respectively. | | | | | | | | | | | | | | |

Table 5.17.5-3: Supplementary uplink configuration (exceptions due to harmonic issue)

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| UL band | DL band | 5 MHz  (NRB) | 10 MHz  (NRB) | 15 MHz  (NRB) | 20 MHz  (NRB) | 25 MHz  (NRB) | 30MHz  (NRB) | 40 MHz  (NRB) | 50 MHz  (NRB) | 60 MHz  (NRB) | 80 MHz  (NRB) | 90 MHz  (NRB) | 100 MHz  (NRB) |
| n99 | n77 |  | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 |
| NOTE 1:   15 kHz SCS is assumed for UL band.  NOTE 2: The UL configuration applies regardless of the channel bandwidth of the low band  NOTE 3: Unless stated otherwise, UL resource blocks shall be centered within the transmission bandwidth configuration for the channel bandwidth. | | | | | | | | | | | | | |

5.17.6 ∆TIB and ∆RIB values

For SUL\_n77-n99, the ΔTIB,c and ΔRIB,c values are given in the tables below according to CA\_n66-n77 relaxation values.

**Table 5.17.6-1: ΔTIB,c**

| SUL Band combination | NR Band | ΔTIB,c [dB] |
| --- | --- | --- |
| SUL\_n77-n99 | n77 | 0.6 |
| n99 | 0.8 |

**Table 5.17.6-2: ΔRIB,c**

| SUL Band combination | NR Band | ΔRIB,c [dB] |
| --- | --- | --- |
| SUL\_n77-n99 | n77 | 0.5 |

5.18 SUL\_n41-n97

5.18.1 Operating bands

**Table 5.18.1-1: SUL band combination**

|  |  |
| --- | --- |
| NR Band combination for SUL | NR Band  (Table 5.2-1) |
| SUL\_n41-n972 | n41, n97 |
| NOTE 1: If a UE is configured with both NR UL and NR SUL carriers in a cell, the switching time between NR UL carrier and NR SUL carrier is 0 us.  NOTE 2: For UE supporting SUL band combination simultaneous Rx/Tx capability is mandatory. | |

5.18.2 Channel bandwidths per operating band

**Table 5.18.2-1: Supported bandwidths per SUL band combination**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **SUL band combination with CA** | **UL configuration** | **NR Band** | **Subcarrier spacing**  **(kHz)** | **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** | **Bandwidth combination set** |
| SUL\_n41A-n97A | SUL\_n41A-n97A | n41 | 15 |  | Yes | Yes | Yes |  | Yes | Yes | Yes |  |  |  |  |  | 0 |
| 30 |  | Yes | Yes | Yes |  | Yes | Yes | Yes | Yes |  | Yes | Yes | Yes |
| 60 |  | Yes | Yes | Yes |  | Yes | Yes | Yes | Yes |  | Yes | Yes | Yes |
| n97 | 15 | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |  |  |  |  |  |
| 30 |  | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |  | Yes |  |  |
| 60 |  | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |  | Yes |  |  |

5.18.3 Maximum output power

There is only single UL in uplink so the requirement for each band in clause 6.2.1 from 38.101-1 is applicable.

5.18.4 Spurious emission band UE co-existence

There is only single UL in uplink so this requirement specified in clause 6.5.3.2 from 38.101-1 is applicable.

Table 5.18.4-1 summarizes frequency ranges where harmonics and/or harmonics mixing occur for SUL\_n41-n97.

**Table 5.18.4-1: Impact of UL/DL Harmonic/Harmonic mixing**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  | **2nd Harmonic** | | **3rd Harmonic** | | **4th Harmonic** | |
| **Band** | | **Low Band Edge** | High Band Edge | Low Band Edge | High Band Edge | Low Band Edge | High Band Edge | Low Band Edge | High Band Edge |
| n41 | UL/DL frequency range | 2496 | 2690 | 4992 | 5380 | 7488 | 8070 | 9984 | 10760 |
| n97 | UL frequency range | 2300 | 2400 | 4600 | 4800 | 6900 | 7200 | 9200 | 9600 |

There is no harmonic/harmonic mixing issue for this band combination. However, it may have MSD due to cross band isolation between band n41 and n97.

5.18.5 REFSENS requirements

For SUL operation with CA, the reference receive sensitivity (REFSENS) requirement for downlink bands specified in clause 7.3A.2 from TS 38.101-1 shall be met when supplementary uplink configuration for reference sensitivity are specified as below.

Table 5.18.5-1: Supplementary uplink configuration for reference sensitivity

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | NR Band / SCS of SUL band / Channel bandwidth of the DL band / NRB | | | | | | | | | | | | | | |
| DL band | SUL band | SCS of SUL band  (kHz) | 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 |
| n41 | n97 | 30 |  | 216 | 216 | 216 |  | 216 | 216 | 216 | 216 |  | 216 | 216 | 216 |
|  | | | | | | | | | | | | | | | |

The MSD exception for SUL\_n41-n97 are specified below.

Table 5.18.5-2: Reference sensitivity exceptions due to cross band isolation

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| UL band | | DL band | 5 MHz  (dB) | 10 MHz  (dB) | 15 MHz  (dB) | 20 MHz  (dB) | 25 MHz  (dB) | 30MHz  (dB) | 40 MHz  (dB) | 50 MHz  (dB) | 60 MHz  (dB) | 80 MHz  (dB) | 90 MHz  (dB) | 100 MHz  (dB) |
| n97 | | n41 |  | [20.7] | [18.9] | [17.7] |  | [15.8] | [14.5] | [13.5] | [12.8] | [11.5] | [11.0] | [10.6] |
| NOTE 1:   The n41 requirements are modified by -0.5dB when carrier frequency of the assigned NR channel bandwidth is within 2515 – 2690 MHz. | | | | | | | | | | | | | | |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

Table 5.18.5-3: Uplink configuration for reference sensitivity exceptions due to cross band isolation

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| UL band | DL band | 5 MHz  (NRB) | 10 MHz  (NRB) | 15 MHz  (NRB) | 20 MHz  (NRB) | 25 MHz  (NRB) | 30MHz  (NRB) | 40 MHz  (NRB) | 50 MHz  (NRB) | 60 MHz  (NRB) | 80 MHz  (NRB) | 90 MHz  (NRB) | 100 MHz  (NRB) |
| n97X | n41 |  | 216 | 216 | 216 |  | 216 | 216 | 216 | 216 | 216 | 216 | 216 |
| NOTE X:      30 kHz SCS is assumed for UL band. | | | | | | | | | | | | | |

5.18.6 ∆TIB and ∆RIB values

For SUL\_n41-n97, the ΔTIB,c and ΔRIB,c values are given in the tables below.

**Table 5.18.6-1: ΔTIB,c**

| SUL Band combination | NR Band | ΔTIB,c [dB] |
| --- | --- | --- |
| SUL\_n41-n97 | n41 | 0.5 |
| n97 | 0.5 |

**Table 5.18.6-2: ΔRIB,c**

| SUL Band combination | NR Band | ΔRIB,c [dB] |
| --- | --- | --- |
| SUL\_n41-n97 | n41 | 0 |

5.19 SUL\_n24-n99

5.19.1 Operating bands

**Table 5.19.1-1: SUL band combination**

|  |  |
| --- | --- |
| NR Band combination for SUL | NR Band  (Table 5.2-1) |
| SUL\_n24-n992 | n24, n99 |
| NOTE 1: If a UE is configured with both NR UL and NR SUL carriers in a cell, the switching time between NR UL carrier and NR SUL carrier is 0 us.  NOTE 2: For UE supporting SUL band combination simultaneous Rx/Tx capability is mandatory. | |

5.19.2 Channel bandwidths per operating band

**Table 5.19.2-1: Supported bandwidths per SUL band combination**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **SUL band combination with CA** | **UL configuration** | **NR Band** | **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** | **Bandwidth combination set** |
| SUL\_n24A-n99A | SUL\_n24A-n99A | n24 | 5 | 10 |  |  |  |  |  |  |  |  |  |  |  | 0 |
| n99 | 5 | 10 |  |  |  |  |  |  |  |  |  |  |  |

5.19.3 Maximum output power

There is only single UL in uplink so the requirement for each band in clause 6.2.1 from 38.101-1 is applicable.

5.19.4 Spurious emission band UE co-existence

There is only single UL in uplink so this requirement specified in clause 6.5.3.2 from 38.101-1 is applicable.

5.19.5 REFSENS requirements

For SUL operation with CA, the reference receiver sensitivity (REFSENS) requirement for downlink bands specified in clause 7.3A.2 from TS 38.101-1 shall be met when supplementary uplink configuration for reference sensitivity are specified as below.

Table 5.19.5-1: Supplementary uplink configuration for reference sensitivity

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | NR Band / SCS of SUL band / Channel bandwidth of the DL band / NRB | | | | | | | | | | | | | | |
| DL band | SUL band | SCS of SUL band  (kHz) | 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 |
| n24 | n99 | 15 | 25 | 50 |  |  |  |  |  |  |  |  |  |  |  |

There is no harmonic/harmonic mixing issue for this band combination.

5.19.6 ∆TIB and ∆RIB values

For SUL\_n24-n99, the ΔTIB,c and ΔRIB,c values are given in the tables below.

**Table 5.19.6-1: ΔTIB,c**

| SUL Band combination | NR Band | ΔTIB,c [dB] |
| --- | --- | --- |
| SUL\_n24-n99 | n24 | 0 |
| n99 | 0 |

**Table 5.19.6-2: ΔRIB,c**

| SUL Band combination | NR Band | ΔRIB,c [dB] |
| --- | --- | --- |
| SUL\_n24-n99 | n24 | 0 |

5.20 CA\_n3\_SUL\_n41-n80

5.20.1 Operating bands

**Table 5.20.1-1: SUL band combination**

|  |  |
| --- | --- |
| NR Band combination for SUL | NR Band  (Table 5.2-1) |
| CA\_n3\_SUL\_n41-n80 | n3, n41, n80 |
| NOTE 1: If a UE is configured with both NR UL and NR SUL carriers in a cell, the switching time between NR UL carrier and NR SUL carrier is 0 us.  NOTE 2: For UE supporting SUL band combination simultaneous Rx/Tx capability is mandatory. | |

5.20.2 Channel bandwidths per operating band

**Table 5.20.2-1: Supported bandwidths per SUL band combination**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **SUL band combination with CA** | **UL configuration** | **NR Band** | **Subcarrier spacing**  **(kHz)** | **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** | **Bandwidth combination set** |
| CA\_n3A\_SUL\_n41A-n80A | SUL\_n41A-n80A | n3 | 15 | Yes | Yes | Yes | Yes | Yes | Yes | Yes |  |  |  |  |  |  | 0 |
| 30 |  | Yes | Yes | Yes | Yes | Yes | Yes |  |  |  |  |  |  |
| 60 |  | Yes | Yes | Yes | Yes | Yes | Yes |  |  |  |  |  |  |
| n41 | 15 |  | Yes | Yes | Yes |  | Yes | Yes | Yes |  |  |  |  |  |
| 30 |  | Yes | Yes | Yes |  | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| 60 |  | Yes | Yes | Yes |  | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| n80 | 15 | Yes | Yes | Yes | Yes | Yes | Yes | Yes |  |  |  |  |  |  |
| 30 |  | Yes | Yes | Yes | Yes | Yes | Yes |  |  |  |  |  |  |
| 60 |  | Yes | Yes | Yes | Yes | Yes | Yes |  |  |  |  |  |  |
| CA\_n3A\_SUL\_n41C-n80A | SUL\_n41A-n80A | n3 | 15 | Yes | Yes | Yes | Yes | Yes | Yes | Yes |  |  |  |  |  |  | 0 |
| 30 |  | Yes | Yes | Yes | Yes | Yes | Yes |  |  |  |  |  |  |
| 60 |  | Yes | Yes | Yes | Yes | Yes | Yes |  |  |  |  |  |  |
| n41 | See CA\_n41C Bandwidth Combination Set 1 in Table 5.5A.1-1 | | | | | | | | | | | | | |
| n80 | 15 | Yes | Yes | Yes | Yes | Yes | Yes | Yes |  |  |  |  |  |  |
| 30 |  | Yes | Yes | Yes | Yes | Yes | Yes |  |  |  |  |  |  |
| 60 |  | Yes | Yes | Yes | Yes | Yes | Yes |  |  |  |  |  |  |

5.20.3 Maximum output power

There is only single UL in uplink so the requirement for each band in clause 6.2.1 from 38.101-1 is applicable.

5.20.4 Spurious emission band UE co-existence

There is only single UL in uplink so this requirement specified in clause 6.5.3.2 from 38.101-1 is applicable.

Table 5.20.4-1 summarizes frequency ranges where harmonics and/or harmonics mixing occur for CA\_n3\_SUL\_n41-n80.

**Table 5.20.4-1: Impact of UL/DL Harmonic/Harmonic mixing**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  | **2nd Harmonic** | | **3rd Harmonic** | | **4th Harmonic** | |
| **Band** | | **Low Band Edge** | High Band Edge | Low Band Edge | High Band Edge | Low Band Edge | High Band Edge | Low Band Edge | High Band Edge |
| n3 | DL frequency range | 1805 | 1880 | 3610 | 3760 | 5415 | 5640 | 7220 | 7520 |
| n41 | UL/DL frequency range | 2496 | 2690 | 4992 | 5380 | 7488 | 8070 | 9984 | 10760 |
| n80 | UL frequency range | 1710 | 1785 | 3420 | 3570 | 5130 | 5355 | 6840 | 7140 |

5.20.5 REFSENS requirements

For SUL operation with CA, the reference receive sensitivity (REFSENS) requirement for downlink bands specified in clause 7.3A.2 from TS 38.101-1 shall be met when supplementary uplink configuration for reference sensitivity are specified as below. MSD due to cross band isolation has been specified in the spec.

Table 5.20.5-1: Supplementary uplink configuration for reference sensitivity

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | NR Band / SCS of SUL band / Channel bandwidth of the DL band / NRB | | | | | | | | | | | | | | |
| DL band | SUL band | SCS of SUL band  (kHz) | 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 |
| n3 | n801 | 15 | 25 | 50 | 50 | 50 | 50 | 50 | 50 |  |  |  |  |  |  |
| n41 | n80 | 15 |  | 160 | 160 | 160 |  | 160 | 160 | 160 | 160 | 160 | 160 | 160 | 160 |
| NOTE 1: The Tx-Rx carrier center frequency separation between SUL band and DL band is the same as the Tx-Rx carrier center frequency separation of DL band specified in table 5.4.4-1 from TS 38.101-1. The channel bandwidth of SUL band is the same as DL band. | | | | | | | | | | | | | | | |

5.20.6 ∆TIB and ∆RIB values

For CA\_n3\_SUL\_n41-n80, the ΔTIB,c and ΔRIB,c values are given in the tables below.

**Table 5.20.6-1: ΔTIB,c**

| SUL Band combination | NR Band | ΔTIB,c [dB] |
| --- | --- | --- |
| CA\_n3\_SUL\_n41-n80 | n3 | 0.5 |
| n41 | 0.31 |
| 0.82 |
| n80 | 0.5 |
| NOTE 1: The requirement is applied for UE transmitting on the frequency range of 2515-2690 MHz.  NOTE 2: The requirement is applied for UE transmitting on the frequency range of 2496-2515 MHz. | | |

**Table 5.20.6-2: ΔRIB,c**

| SUL Band combination | NR Band | ΔRIB,c [dB] |
| --- | --- | --- |
| CA\_n3\_SUL\_n41-n80 | n41 | 01 |
| 0.52 |
| NOTE 1: The requirement is applied for UE transmitting on the frequency range of 2515-2690 MHz.  NOTE 2: The requirement is applied for UE transmitting on the frequency range of 2496-2515 MHz. | | |

5.21 CA\_n3\_SUL\_n79-n80

5.21.1 Operating bands

**Table 5.21.1-1: SUL band combination**

|  |  |
| --- | --- |
| NR Band combination for SUL | NR Band  (Table 5.2-1) |
| CA\_n3\_SUL\_n79-n80 | n3, n79, n80 |
| NOTE 1: If a UE is configured with both NR UL and NR SUL carriers in a cell, the switching time between NR UL carrier and NR SUL carrier is 0 us.  NOTE 2: For UE supporting SUL band combination simultaneous Rx/Tx capability is mandatory. | |

5.21.2 Channel bandwidths per operating band

**Table 5.21.2-1: Supported bandwidths per SUL band combination**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **SUL band combination with CA** | **UL configuration** | **NR Band** | **Subcarrier spacing**  **(kHz)** | **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** | **Bandwidth combination set** |
| CA\_n3A\_SUL\_n79A-n80A | SUL\_n79A-n80A | n3 | 15 | Yes | Yes | Yes | Yes | Yes | Yes | Yes |  |  |  |  |  |  | 0 |
| 30 |  | Yes | Yes | Yes | Yes | Yes | Yes |  |  |  |  |  |  |
| 60 |  | Yes | Yes | Yes | Yes | Yes | Yes |  |  |  |  |  |  |
| n79 | 15 |  |  |  |  |  |  | Yes | Yes |  |  |  |  |  |
| 30 |  |  |  |  |  |  | Yes | Yes | Yes |  | Yes |  | Yes |
| 60 |  |  |  |  |  |  | Yes | Yes | Yes |  | Yes |  | Yes |
| n80 | 15 | Yes | Yes | Yes | Yes | Yes | Yes | Yes |  |  |  |  |  |  |
| 30 |  | Yes | Yes | Yes | Yes | Yes | Yes |  |  |  |  |  |  |
| 60 |  | Yes | Yes | Yes | Yes | Yes | Yes |  |  |  |  |  |  |
| CA\_n3A\_SUL\_n79C-n80A | SUL\_n79A-n80A | n3 | 15 | Yes | Yes | Yes | Yes | Yes | Yes | Yes |  |  |  |  |  |  | 0 |
| 30 |  | Yes | Yes | Yes | Yes | Yes | Yes |  |  |  |  |  |  |
| 60 |  | Yes | Yes | Yes | Yes | Yes | Yes |  |  |  |  |  |  |
| n79 | See CA\_n79C Bandwidth Combination Set 0 in Table 5.5A.1-1 | | | | | | | | | | | | | |
| n80 | 15 | Yes | Yes | Yes | Yes | Yes | Yes | Yes |  |  |  |  |  |  |
| 30 |  | Yes | Yes | Yes | Yes | Yes | Yes |  |  |  |  |  |  |
| 60 |  | Yes | Yes | Yes | Yes | Yes | Yes |  |  |  |  |  |  |

5.21.3 Maximum output power

There is only single UL in uplink so the requirement for each band in clause 6.2.1 from 38.101-1 is applicable.

5.21.4 Spurious emission band UE co-existence

There is only single UL in uplink so this requirement specified in clause 6.5.3.2 from 38.101-1 is applicable.

Table 5.21.4-1 summarizes frequency ranges where harmonics and/or harmonics mixing occur for CA\_n3\_SUL\_n79-n80.

**Table 5.21.4-1: Impact of UL/DL Harmonic/Harmonic mixing**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  | **2nd Harmonic** | | **3rd Harmonic** | | **4th Harmonic** | |
| **Band** | | **Low Band Edge** | High Band Edge | Low Band Edge | High Band Edge | Low Band Edge | High Band Edge | Low Band Edge | High Band Edge |
| n3 | DL frequency range | 1805 | 1880 | 3610 | 3760 | 5415 | 5640 | 7220 | 7520 |
| n79 | UL/DL frequency range | 4400 | 5000 | 8800 | 10000 | 15000 | 8070 | 17600 | 20000 |
| n80 | UL frequency range | 1710 | 1785 | 3420 | 3570 | 5130 | 5355 | 6840 | 7140 |

5.21.5 REFSENS requirements

For SUL operation with CA, the reference receive sensitivity (REFSENS) requirement for downlink bands specified in clause 7.3A.2 from TS 38.101-1 shall be met when supplementary uplink configuration for reference sensitivity are specified as below.

Table 5.21.5-1: Supplementary uplink configuration for reference sensitivity

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | NR Band / SCS of SUL band / Channel bandwidth of the DL band / NRB | | | | | | | | | | | | | | |
| DL band | SUL band | SCS of SUL band  (kHz) | 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 |
| n3 | n801 | 15 | 25 | 50 | 50 | 50 | 50 | 50 | 50 |  |  |  |  |  |  |
| n79 | n80 | 15 |  |  |  |  |  |  | 160 | 160 | 160 |  | 160 |  | 160 |
| NOTE 1: The Tx-Rx carrier center frequency separation between SUL band and DL band is the same as the Tx-Rx carrier center frequency separation of DL band specified in table 5.4.4-1 from TS 38.101-1. The channel bandwidth of SUL band is the same as DL band. | | | | | | | | | | | | | | | |

5.21.6 ∆TIB and ∆RIB values

For CA\_n3\_SUL\_n79-n80, the ΔTIB,c and ΔRIB,c values are given in the tables below.

**Table 5.21.6-1: ΔTIB,c**

| SUL Band combination | NR Band | ΔTIB,c [dB] |
| --- | --- | --- |
| CA\_n3\_SUL\_n79-n80 | n3 | 0.3 |
| n79 | 0.8 |
| n80 | 0.3 |
|  | | |

**Table 5.21.6-2: ΔRIB,c**

| SUL Band combination | NR Band | ΔRIB,c [dB] |
| --- | --- | --- |
| CA\_n3\_SUL\_n79-n80 | n79 | 0.5 |
|  | | |

## 5.Y SUL\_nX-nY/CA\_nX\_SUL\_nY-nZ

### 5.Y.1 Operating bands

### 5.Y.2 Configuration

### 5.Y.3 Maximum output power

*<Editor’s note: This requirement is only applicable when there is simultaneous transmission in the band combination.>*

### 5.Y.4 Spurious emission band UE co-existence

*<Editor’s note: This requirement is only applicable when there is simultaneous transmission in the band combination.>*

### 5.Y.5 REFSENS requirements

### 5.Y.6 ∆TIB and ∆RIB values

### 5.Y.7 Out-of-band blocking exception

*<Editor’s note: This requirement is only applicable when there is Out-of-band blocking exception in the band combination.>*

# 6 NSA NR SUL band combination: Specific Band Combination Part

## 6.Y DC\_X\_SUL\_nY-nZ

### 6.Y.1 Operating bands

### 6.Y.2 Configuration

### 6.Y.3 Maximum output power

### 6.Y.4 Spurious emission band UE co-existence

### 6.Y.5 REFSENS requirements

### 6.Y.6 ∆TIB and ∆RIB values

# 7 NSA NR SUL with UL sharing from ULSUP band combination: Specific Band Combination Part

## 7.1 DC\_28\_SUL\_n41-n83

### 7.1.1 Operating bands

**Table 7.1.1-1: EN-DC band combination**

| EN-DC Band | E-UTRA Band | NR Band | Single UL allowed |
| --- | --- | --- | --- |
| DC\_28\_SUL\_n41-n832 | 1 | SUL\_n41-n83 | N/A |
| NOTE 1: If a UE is configured with both NR UL and NR SUL carriers in a cell, the switching time between NR UL carrier and NR SUL carrier can be up to 140us and placed in SUL resources.  NOTE 2: Applicable for UE supporting inter-band carrier aggregation with mandatory simultaneous Rx/Tx capability. | | | |

### 7.1.2 Configuration

Table 7.1.2-1: Inter-band EN-DC configurations

| EN-DC  configuration | Uplink EN-DC  configuration  (NOTE 1) | E-UTRA configuration | NR configuration |
| --- | --- | --- | --- |
| DC\_28A\_SUL\_n41A-n83A | DC\_28A\_n41A  DC\_28A\_n83A\_ULSUP-TDM\_n41 | 28A | SUL\_n41A-n83A |

### 7.1.3 Maximum output power

Table 7.1.3-1: Maximum output power for inter-band EN-DC

| DC configuration | Power class 3  (dBm) | Tolerance  (dB) |
| --- | --- | --- |
| DC\_28A\_n41A DC\_28A\_n83A\_ULSUP-TDM\_n41 | 23 | +2/-3 |

### 7.1.4 Spurious emission band UE co-existence

Table 7.1.4-1: Spurious emissions for inter-band EN-DC

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **EN-DC Configuration** | **Spurious emission** | | | | | | |
| **Protected band** | **Frequency range (MHz)** | | | **Maximum Level (dBm)** | **MBW (MHz)** | **NOTE** |
| DC\_28\_n41 DC\_28\_n83\_ULSUP-TDM\_n41 | E-UTRA Band 4, 10, 12, 13, 14, 17, 18, 19, 20, 26, 27, 29, 39, 42, 43, 50, 51, 52, 65, 66, 71, 73, 85  NR Band n77, n78, n79 | FDL\_low | - | FDL\_high | -50 | 1 | 2 |
| E-UTRA Band 1 | FDL\_low | - | FDL\_high | -50 | 1 | 9, 10 |
| E-UTRA Band 2, 3, 5, 8, 24, 25, 30, 31, 34, 40, 44, 48, 70, 72 | FDL\_low | - | FDL\_high | -50 | 1 |  |
| E-UTRA Band 11, 21, 74, 75, 76 | FDL\_low | - | FDL\_high | -50 | 1 | 9, 11 |
| Frequency range | 470 | - | 694 | -42 | 8 | 5, 17 |
| Frequency range | 470 | - | 710 | -26.2 | 6 | 14 |
| NOTE 2: As exceptions, measurements with a level up to the applicable requirements defined in Table 6.6.3.1-2 are permitted for each assigned E-UTRA 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 180 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: These requirements also apply for the frequency ranges that are less than FOOB (MHz) in Table 6.6.3.1-1 and Table 6.6.3.1A-1 from the edge of the channel bandwidth.  NOTE 9: 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.  NOTE 10: 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 2nd 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 2nd harmonic totally or partially overlaps the measurement bandwidth (MBW).  NOTE 11: As exceptions, measurements with a level up to the applicable requirement of -38 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 14: This requirement is applicable for 5 and 10 MHz E-UTRA 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 17: This requirement is applicable in the case of a 10 MHz E-UTRA carrier confined within 703 MHz and 733 MHz, otherwise the requirement of -25 dBm with a measurement bandwidth of 8 MHz applies. | | | | | | | |

### 7.1.5 MSD

For DC\_28\_SUL\_n41-n83, there are neither harmonic and harmonic mixing products generated by Band 28/n83 that may fall into the RX band of Band n41 nor IMD products produced by Band 28 and n41 that impact the reference sensitivity of Band 28. Therefore, MSD requirements are not needed for this configuration.

### 7.1.6 ∆TIB and ∆RIB values

For DC\_28\_SUL\_n41-n83, the TIB,c and RIB values are given in the tables below.

Table 7.1.6-1: ΔTIB,c

| EN-DC Band combination | NR Band | ΔTIB,c [dB] |
| --- | --- | --- |
| DC\_28\_SUL\_n41-n83 | 28 | 0.3 |
| n41 | 0.3 |
| n83 | 0.3 |

Table 7.1.6-2: ΔRIB,c

| EN-DC Band combination | NR Band | ΔRIB,c [dB] |
| --- | --- | --- |
| DC\_28\_SUL\_n41-n83 | 28 | 0 |
| n41 | 0 |

## 7.Y DC\_X\_SUL\_nY-nZ

### 7.Y.1 Operating bands

### 7.Y.2 Configuration

### 7.Y.3 Maximum output power

### 7.Y.4 Spurious emission band UE co-existence

### 7.Y.5 REFSENS requirements

### 7.Y.6 ∆TIB and ∆RIB values

# Annex A (informative): Change history

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Change history** | | | | | | | |
| **Date** | **Meeting** | **TDoc** | **CR** | **Rev** | **Cat** | **Subject/Comment** | **New version** |
| 2020-08 | 3GPP RAN4#96-e | R4-2001223 |  |  |  | Initial TR skeleton | 0.0.1 |
| 2020-08 | 3GPP RAN4#96-e | R4-2001224 |  |  |  | Implemented TP’s from RAN4#96e  R4-2011668 TP to TR 37.717-00-00 SUL\_n41A-n83A, Huawei, HiSilicon, Etisalat, CMCC  R4-2011669 TP to TR 37.717-00-00 SUL\_n79A-n83A, Huawei, CBN, CMCC, HiSilicon, ABS  R4-2011671 TP to TR 37.717-00-00 DC\_28A\_SUL\_n41A-n83A, Huawei, HiSilicon, Etisalat, CMCC  R4-2011672 TP for TR 37.717-00-00 for CA\_n28A-n41A\_SUL\_n41A-n83A, Huawei, HiSilicon  R4-2011673 TP for TR 37.717-00-00 for CA\_n28A-n79A\_SUL\_n79A-n83A, Huawei, HiSilicon | 0.1.0 |
| 2020-11 | 3GPP RAN4#97-e | R4-2014801 |  |  |  | Implemented TP’s from RAN4#97e  R4-2015540 TP for TR 37.717-00-00 to correct the notation of SUL band, Huawei, HiSilicon  R4-2016748 TP for TR 37.717-00-00 for CA\_n1A\_SUL\_n78A-n80A, Huawei, HiSilicon  R4-2016749 TP for TR 37.717-00-00 for CA\_n1A\_SUL\_n78A-n84A, Huawei, HiSilicon  R4-2016750 TP for TR 37.717-00-00 for CA\_n41A\_SUL\_n79A-n80A, Huawei, HiSilicon  R4-2016751 TP for TR 37.717-00-00 for CA\_n79A\_SUL\_n41A-n80A, Huawei, HiSilicon | 0.2.0 |
| 2021-02 | 3GPP RAN4#98-e | R4-2100292 |  |  |  | Implemented TP’s from RAN4#98e  R4-2103070 TP for TR 37.717-00-00 for CA\_n3A\_SUL\_n78A-n80A, Huawei, HiSilicon  R4-2103071 TP for TR 37.717-00-00 for CA\_n41A\_SUL\_n79A-n83A, Huawei, HiSilicon  R4-2103072 TP for TR 37.717-00-00 for CA\_n79A\_SUL\_n41A-n83A, Huawei, HiSilicon  R4-2103074 TP for TR 37.717-00-00 for SUL\_n79A-n97A, Huawei, HiSilicon  R4-2103075 TP for TR 37.717-00-00 for SUL\_n41A-n98A, Huawei, HiSilicon  R4-2101611 TP for TR 37.717-00-00 for SUL\_n79A-n98A, Huawei, HiSilicon | 0.3.0 |
| 2021-04 | 3GPP RAN4#98bis-e | R4-2106660 |  |  |  | Implemented TP’s from RAN4#98bis-e  R4-2105165 TP for TR 37.717-00-00:SUL\_n41A-n99A and SUL\_n41A(2A)-n99A  R4-2105166 TP for TR 37.717-00-00:SUL\_n48A-n99A and SUL\_n48A(2A)-n99A  R4-2105167 TP for TR 37.717-00-00:SUL\_n77A-n99A and SUL\_n77A(2A)-n99A  R4-2106654 Updated TP for TR 37.717-00-00 for CA\_n3A\_SUL\_n78C-n80A  R4-2106655 Updated TP for TR 37.717-00-00 for CA\_n1A\_SUL\_n78C-n84A  R4-2106656 Updated TP for TR 37.717-00-00 for CA\_n28A\_SUL\_n41C-n83A  R4-2106657 Updated TP for TR 37.717-00-00 for CA\_n28A\_SUL\_n79C-n83A  R4-2105276 TP for TR 37.717-00-00 for SUL\_n41A-n97A  R4-2105164 TP for TR 37.717-00-00:SUL\_n24A-n99A | 0.4.0 |
| 2021-05 | 3GPP RAN4#99-e | R4-2109767 |  |  |  | R4-2110252 Updated TP for TR 37.717-00-00 for CA\_n3\_SUL\_n78-n80, Huawei, HiSilicon  R4-2110253 TP for TR 37.717-00-00 for CA\_n3A\_SUL\_n79A-n80A / CA\_n3A\_SUL\_n79C-n80A, Huawei, HiSilicon  R4-2110254 TP for TR 37.717-00-00 for CA\_n3A\_SUL\_n41A-n80A / CA\_n3A\_SUL\_n41C-n80A, Huawei, HiSilicon | 0.5.0 |