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| 3GPP TR 38.898 V0.7.0 (2023-11) | |
| Technical Report | |
| High power UE (power class m with 1<m<3) for a single FR1 band in UL of Dual Connectivity (DC) combinations of x bands (x=1,2,3, 4 for y=1 or x=1, 2 for y=2) LTE inter-band CA (xDL/1UL) and y bands NR inter-band CA (yDL/1UL)  (Release 18) | |
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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;

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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 High power UE (power class m with 1<m<3) for a single FR1 band in UL of Dual Connectivity (DC) combinations of x bands (x=1,2,3, 4 for y=1 or x=1, 2 for y=2) LTE inter-band CA (xDL/1UL) and y bands NR inter-band CA (yDL/1UL) in the Rel-18 time frame. The purpose is to gather the relevant background information and studies to address relevant requirements for the Rel-18 EN-DC HPUE band combinations requested by proponents and captured in the WID.

# 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-222660, “New WID on High power UE for FR1 for DC\_R18\_xBLTE\_yBNR\_zDLnUL”, RAN#97-e

# 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>

## 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>

# 4 Background

The present document is a technical report for EN-DC HPUE band combinations in the Rel-18 timeframe. The document covers each band combination specific issues (i.e. one sub-clause 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 combination to ensure that the TPs related to the band combination have been implemented.

# 5 EN-DC Power Class 2: Specific Band Combination Part

### 5.1 DC\_1\_n79

#### 5.1.1 Configuration for DC

When requested EN-DC configuration is 2DL2UL, it is not needed to update the inter-band EN-DC configuration table. By referring to the maximum output power table, it can be checked whether these configurations support PC2. This band combination for PC3 is already specified in TS 38.101-3, so this section is omitted.

#### 5.1.2 Maximum output power for DC

**Table 5.1.2-1:** **Maximum output power for inter-band EN-DC (two bands)**

| EN-DC configuration | Power class 2  (dBm) | Tolerance  (dB) | Power class 3  (dBm) | Tolerance  (dB) |
| --- | --- | --- | --- | --- |
| DC\_1A\_n79A | 266,8 | +2/-3 | 23 | +2/-3 |
| NOTE 6: The UE supports PC3 within E-UTRA cell group, and supports either PC3 or PC2 within NR cell group. Power class support within each individual cell group is signaled separately by the UE.  NOTE 8: The UE that supports PC3 within a TDD or FDD band and supports PC2 within a second TDD band may signal a [HigherPowerLimitCADC] capability whereby the maximum output power indicated in the table may be exceeded in accordance with sub-clause 6.2B.4.1.3. | | | | |

#### 5.1.3 REFSENS requirements for DC

Analysis of REFSENS exceptions or MSD requirements is needed due to higher power UL DC. For PC3 DC\_1\_n79, the co-existence study is provided in TR 37.863-01-01 [1]. Based on above,

* the 2nd, 3rd, 4th, and 5th order harmonic do not fall into Rx frequencies of band 1.
* the 2nd, 3rd, 4th, and 5th order harmonic mixing do not fall into Rx frequencies of band 1.
* the 2nd, 3rd, 4th, and 5th order IMD do not fall into Rx frequencies of band 1 and n79.

Therefore, there is no MSD issue for this DC configuration.

#### 5.1.4 ∆TIB and ∆RIB values

There is no change by comparing to the values for PC3 DC, so this section is omitted.

### 5.2 DC\_3\_n79

#### 5.2.1 Configuration for DC

When requested EN-DC configuration is 2DL2UL, it is not needed to update the inter-band EN-DC configuration table. By referring to the maximum output power table, it can be checked whether these configurations support PC2. This band combination for PC3 is already specified in TS 38.101-3, so this section is omitted.

#### 5.2.2 Maximum output power for DC

**Table 5.2.2-1:** **Maximum output power for inter-band EN-DC (two bands)**

| EN-DC configuration | Power class 2  (dBm) | Tolerance  (dB) | Power class 3  (dBm) | Tolerance  (dB) |
| --- | --- | --- | --- | --- |
| DC\_3A\_n79A | 266,8 | +2/-3 | 23 | +2/-3 |
| NOTE 6: The UE supports PC3 within E-UTRA cell group, and supports either PC3 or PC2 within NR cell group. Power class support within each individual cell group is signaled separately by the UE.  NOTE 8: The UE that supports PC3 within a TDD or FDD band and supports PC2 within a second TDD band may signal a [HigherPowerLimitCADC] capability whereby the maximum output power indicated in the table may be exceeded in accordance with sub-clause 6.2B.4.1.3. | | | | |

#### 5.2.3 REFSENS requirements for DC

Analysis of REFSENS exceptions or MSD requirements is needed due to higher power UL DC. For PC3 DC\_3\_n79, the co-existence study is provided in TR 37.863-01-01 [1]. Based on above,

* the 2nd, 3rd, 4th, and 5th order harmonic do not fall into Rx frequencies of band 3.
* the 2nd, 3rd, 4th, and 5th order harmonic mixing do not fall into Rx frequencies of band 3.
* the 2nd, 3rd, 4th, and 5th order IMD do not fall into Rx frequencies of band 3 and n79.

Therefore, there is no MSD issue for this DC configuration.

#### 5.2.4 ∆TIB and ∆RIB values

There is no change by comparing to the values for PC3 DC, so this section is omitted.

### 5.3 DC\_19\_n79

#### 5.3.1 Configuration for DC

When requested EN-DC configuration is 2DL2UL, it is not needed to update the inter-band EN-DC configuration table. By referring to the maximum output power table, it can be checked whether these configurations support PC2. This band combination for PC3 is already specified in TS 38.101-3, so this section is omitted.

#### 5.3.2 Maximum output power for DC

**Table 5.3.2-1:** **Maximum output power for inter-band EN-DC (two bands)**

| EN-DC configuration | Power class 2  (dBm) | Tolerance  (dB) | Power class 3  (dBm) | Tolerance  (dB) |
| --- | --- | --- | --- | --- |
| DC\_19A\_n79A | 266,8 | +2/-3 | 23 | +2/-3 |
| NOTE 6: The UE supports PC3 within E-UTRA cell group, and supports either PC3 or PC2 within NR cell group. Power class support within each individual cell group is signaled separately by the UE.  NOTE 8: The UE that supports PC3 within a TDD or FDD band and supports PC2 within a second TDD band may signal a [HigherPowerLimitCADC] capability whereby the maximum output power indicated in the table may be exceeded in accordance with sub-clause 6.2B.4.1.3. | | | | |

#### 5.3.3 REFSENS requirements for DC

Analysis of REFSENS exceptions or MSD requirements is needed due to higher power UL DC. For PC3 DC\_19\_n79, the co-existence study is provided in TR 37.863-01-01. [1] Based on above,

* the 5th order harmonic mixing may fall into Rx frequencies of band 19.
* the 2nd, 3rd, 4th, and 5th order harmonic do not fall into Rx frequencies of band 19.
* the 2nd, 3rd, and 4th order harmonic mixing do not fall into Rx frequencies of band 19.
* the 2nd, 3rd, 4th, and 5th order IMD do not fall into Rx frequencies of band 19 and n79.

For MSD due to 5th harmonic mixing, MSD value of PC2 case will be 3dB higher than that of PC3 case. New MSD values are shown in Table 5.3.3-1 below. Uplink configuration is shown in Table 5.3.3-2 below.

**Table 5.3.3-1:** **Reference sensitivity exceptions (MSD) due to receiver harmonic mixing for PC2 EN-DC in NR FR1**

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| E-UTRA or 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) | 40 MHz  (dB) | 50 MHz  (dB) | 60 MHz  (dB) | 80 MHz  (dB) | 90 MHz  (dB) | 100 MHz  (dB) |
| n79 | 191 | 32.5 | 29.5 | 27.7 |  |  |  |  |  |  |  |  |
| NOTE 1: The requirements should be verified for DL EARFCN of the victim (lower) band (superscript LB) such that  with  the DL carrier frequency in the lower band and the UL carrier frequency in the higher band, both in MHz. | | | | | | | | | | | | |

**Table 5.3.3-2:** **Uplink configuration for reference sensitivity exceptions due to receiver harmonic mixing for EN-DC in NR FR1**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| E-UTRA or NR Band / SCS / Channel bandwidth of the affected DL band / UL RB allocation of the agressor band | | | | | | | | | | | | | |
| UL band | DL band | SCS of UL band  (kHz) | 5 MHz  (LCRB) | 10 MHz  (LCRB) | 15 MHz  (LCRB) | 20 MHz  (LCRB) | 25 MHz  (LCRB) | 40 MHz  (LCRB) | 50 MHz  (LCRB) | 60 MHz  (LCRB) | 80 MHz  (LCRB) | 90 MHz  (LCRB) | 100 MHz  (LCRB) |
| n79 | 19 | 15 | 25 | 50 | 75 |  |  |  |  |  |  |  |  |

#### 5.3.4 ∆TIB and ∆RIB values

There is no change by comparing to the values for PC3 DC, so this section is omitted.

### 5.4 DC\_21\_n79

#### 5.4.1 Configuration for DC

When requested EN-DC configuration is 2DL2UL, it is not needed to update the inter-band EN-DC configuration table. By referring to the maximum output power table, it can be checked whether these configurations support PC2. This band combination for PC3 is already specified in TS 38.101-3, so this section is omitted.

#### 5.4.2 Maximum output power for DC

**Table 5.4.2-1:** **Maximum output power for inter-band EN-DC (two bands)**

| EN-DC configuration | Power class 2  (dBm) | Tolerance  (dB) | Power class 3  (dBm) | Tolerance  (dB) |
| --- | --- | --- | --- | --- |
| DC\_21A\_n79A | 266,8 | +2/-3 | 23 | +2/-3 |
| NOTE 6: The UE supports PC3 within E-UTRA cell group, and supports either PC3 or PC2 within NR cell group. Power class support within each individual cell group is signaled separately by the UE.  NOTE 8: The UE that supports PC3 within a TDD or FDD band and supports PC2 within a second TDD band may signal a [HigherPowerLimitCADC] capability whereby the maximum output power indicated in the table may be exceeded in accordance with sub-clause 6.2B.4.1.3. | | | | |

#### 5.4.3 REFSENS requirements for DC

Analysis of REFSENS exceptions or MSD requirements is needed due to higher power UL DC. For PC3 DC\_21\_n79, the co-existence study is provided in TR 37.863-01-01. [1] Based on above,

* the 3rd order harmonic mixing may fall into Rx frequencies of band 21.
* the 3rd order IMD may fall into Rx frequencies of band 21.
* the 2nd, 3rd, 4th, and 5th order harmonic do not fall into Rx frequencies of band 21.
* the 2nd, 4th, and 5th order harmonic mixing do not fall into Rx frequencies of band 21.
* the 2nd, 4th, and 5th order IMD do not fall into Rx frequencies of band 21 and n79.

For MSD due to 3rd harmonic mixing, MSD value of PC2 case will be 3dB higher than that of PC3 case. New MSD values are shown in Table 5.4.3-1 below. Uplink configuration is shown in Table 5.4.3-2 below.

For MSD due to 3rd IMD, the MSD value can be seen as dB related to 1st order proportional of n79 UL power + 2nd order proportional of B21 UL power. PC3 DC is assumed to be 20dBm+20dBm and PC2 DC is assumed to be 23dBm+23dBm. In addition, PSD will be 6dB higher when UL CBW of n79 is changed from 40MHz to 10MHz. Based on these, B21 UL power of PC2 case is 3dB higher than that of PC3 case, and n79 UL power of PC2 case is 9dB higher than that of PC3 case. Therefore, MSD value of PC2 case will be 15dB higher than that of PC3 case. New MSD values are shown in Table 5.4.3-3 below.

**Table 5.4.3-1:** **Reference sensitivity exceptions (MSD) due to receiver harmonic mixing for PC2 EN-DC in NR FR1**

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| E-UTRA or 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) | 40 MHz  (dB) | 50 MHz  (dB) | 60 MHz  (dB) | 80 MHz  (dB) | 90 MHz  (dB) | 100 MHz  (dB) |
| n79 | 213 | 42.3 | 39.3 | 37.5 |  |  |  |  |  |  |  |  |
| NOTE 3: The requirements should be verified for DL EARFCN or NR ARFCN of the victim (lower) band (superscript LB) such that  with   the DL carrier frequency in the lower band and the UL carrier frequency in the higher band, both in MHz. | | | | | | | | | | | | |

**Table 5.4.3-2:** **Uplink configuration for reference sensitivity exceptions due to receiver harmonic mixing for EN-DC in NR FR1**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| E-UTRA or NR Band / SCS / Channel bandwidth of the affected DL band / UL RB allocation of the agressor band | | | | | | | | | | | | | |
| UL band | DL band | SCS of UL band  (kHz) | 5 MHz  (LCRB) | 10 MHz  (LCRB) | 15 MHz  (LCRB) | 20 MHz  (LCRB) | 25 MHz  (LCRB) | 40 MHz  (LCRB) | 50 MHz  (LCRB) | 60 MHz  (LCRB) | 80 MHz  (LCRB) | 90 MHz  (LCRB) | 100 MHz  (LCRB) |
| n79 | 21 | 15 | 25 | 50 | 75 |  |  |  |  |  |  |  |  |

**Table 5.4.3-3:** **MSD test points for PCell due to dual uplink operation for PC2 EN-DC in NR FR1 (two bands)**

| NR or E-UTRA Band / Channel bandwidth / NRB / MSD | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- |
| EN-DC  Configuration | EUTRA or NR band | UL Fc  (MHz) | UL/DL BW  (MHz) | UL  LCRB | DL Fc (MHz) | MSD  (dB) | IMD order |
| DC\_21A\_n79A | 21 | 1457.5 | 5 | 25 | 1505.5 | 33.4 | IMD3 |
|  | n79 | 4420.5 | 10 | 50 | 4420.5 | N/A | N/A |

#### 5.4.4 ∆TIB and ∆RIB values

There is no change by comparing to the values for PC3 DC, so this section is omitted.

### 5.5 DC\_1\_n77-n79

#### 5.5.1 Configuration for DC

Table 5.5.1-1: Inter-band EN-DC configurations within FR1 (three bands)

| **EN-DC**  **configuration** | **Uplink EN-DC**  **configuration**  **(NOTE 1)** |
| --- | --- |
| DC\_1A\_n77A-n79A14,X | DC\_1A\_n77A14  DC\_1A\_n79A14 |
| NOTE 1: Uplink EN-DC configurations are the configurations supported by the present release of specifications.  NOTE 14: PC3 or PC2 Uplink EN-DC configuration is applicable to EN-DC configurations.  NOTE X: The minimum requirements apply only when there is non-simultaneous Rx/Tx operation between n77-n79 NR carriers. This restriction applies also for these carriers when applicable EN-DC configuration is part of a higher order configuration. | |

#### 5.5.2 Maximum output power for DC

Based on studies of PC2 DC\_1\_n77 and PC2 DC\_1\_n79, this section can be omitted.

#### 5.5.3 REFSENS requirements for DC

Analysis of REFSENS exceptions or MSD requirements is needed due to higher power UL DC. Based on co-existence studies of DC\_1\_n77 and DC\_1\_n79 captured in TR 37.863-01-01 [2], own Rx impact of the 3rd band is the followings.

* the 3rd, 4th, and 5th order IMD generated by dual uplink of band 1 and band n77 may also fall into own Rx of band n79.
* the 5th order IMD generated by dual uplink of band 1 and band n79 may also fall into own Rx of band n77.

However, IMD will not be an issue because the minimum requirements apply only when there is non-simultaneous Rx/Tx operation between n77-n79 NR carriers. Therefore, there is no MSD issue for this DC configuration.

#### 5.5.4 ∆TIB and ∆RIB values

There is no change by comparing to the values for PC3 DC, so this section is omitted.

### 5.6 DC\_3\_n77-n79

#### 5.6.1 Configuration for DC

Table 5.6.1-1: Inter-band EN-DC configurations within FR1 (three bands)

| **EN-DC**  **configuration** | **Uplink EN-DC**  **configuration**  **(NOTE 1)** |
| --- | --- |
| DC\_3A\_n77A-n79A14,X | DC\_3A\_n77A14  DC\_3A\_n79A14 |
| NOTE 1: Uplink EN-DC configurations are the configurations supported by the present release of specifications.  NOTE 14: PC3 or PC2 Uplink EN-DC configuration is applicable to EN-DC configurations.  NOTE X: The minimum requirements apply only when there is non-simultaneous Rx/Tx operation between n77-n79 NR carriers. This restriction applies also for these carriers when applicable EN-DC configuration is part of a higher order configuration. | |

#### 5.6.2 Maximum output power for DC

Based on studies of PC2 DC\_3\_n77 and PC2 DC\_3\_n79, this section can be omitted.

#### 5.6.3 REFSENS requirements for DC

Analysis of REFSENS exceptions or MSD requirements is needed due to higher power UL DC. Based on co-existence studies of DC\_3\_n77 and DC\_3\_n79 captured in TR 37.863-01-01 [2], own Rx impact of the 3rd band is the followings.

* the 3rd and 4th order IMD generated by dual uplink of band 3 and band n77 may also fall into own Rx of band n79.
* the 5th order IMD generated by dual uplink of band 3 and band n79 may also fall into own Rx of band n77.

However, IMD will not be an issue because the minimum requirements apply only when there is non-simultaneous Rx/Tx operation between n77-n79 NR carriers. Therefore, there is no MSD issue for this DC configuration.

#### 5.6.4 ∆TIB and ∆RIB values

There is no change by comparing to the values for PC3 DC, so this section is omitted.

### 5.7 DC\_21\_n77-n79

#### 5.7.1 Configuration for DC

Table 5.7.1-1: Inter-band EN-DC configurations within FR1 (three bands)

| **EN-DC**  **configuration** | **Uplink EN-DC**  **configuration**  **(NOTE 1)** |
| --- | --- |
| DC\_21A\_n77A-n79A14,X | DC\_21A\_n77A14  DC\_21A\_n79A14 |
| NOTE 1: Uplink EN-DC configurations are the configurations supported by the present release of specifications.  NOTE 14: PC3 or PC2 Uplink EN-DC configuration is applicable to EN-DC configurations.  NOTE X: The minimum requirements apply only when there is non-simultaneous Rx/Tx operation between n77-n79 NR carriers. This restriction applies also for these carriers when applicable EN-DC configuration is part of a higher order configuration. | |

#### 5.7.2 Maximum output power for DC

Based on studies of PC2 DC\_21\_n77 and PC2 DC\_21\_n79, this section can be omitted.

#### 5.7.3 REFSENS requirements for DC

Analysis of REFSENS exceptions or MSD requirements is needed due to higher power UL DC. Based on co-existence studies of DC\_21\_n77 and DC\_21\_n79 captured in TR 37.863-01-01 [2], own Rx impact of the 3rd band is the followings.

* the 2nd and 4th order IMD generated by dual uplink of band 21 and band n77 may also fall into own Rx of band n79.
* the 2nd order IMD generated by dual uplink of band 21 and band n79 may also fall into own Rx of band n77.

However, IMD will not be an issue because the minimum requirements apply only when there is non-simultaneous Rx/Tx operation between n77-n79 NR carriers. Therefore, there is no MSD issue for this DC configuration.

#### 5.7.4 ∆TIB and ∆RIB values

There is no change by comparing to the values for PC3 DC, so this section is omitted.

### 5.8 DC\_1\_n78-n79

#### 5.8.1 Configuration for DC

Table 5.8.1-1: Inter-band EN-DC configurations within FR1 (three bands)

| **EN-DC**  **configuration** | **Uplink EN-DC**  **configuration**  **(NOTE 1)** |
| --- | --- |
| DC\_1A\_n78A-n79A14,X | DC\_1A\_n78A14  DC\_1A\_n79A14 |
| NOTE 1: Uplink EN-DC configurations are the configurations supported by the present release of specifications.  NOTE 14: PC3 or PC2 Uplink EN-DC configuration is applicable to EN-DC configurations.  NOTE X: For UEs supporting band n77, the minimum requirements apply only when there is non-simultaneous Rx/Tx operation between n78-n79 NR carriers. This restriction applies also for these carriers when applicable EN-DC configuration is part of a higher order configuration. | |

#### 5.8.2 Maximum output power for DC

Based on studies of PC2 DC\_1\_n78 and PC2 DC\_1\_n79, this section can be omitted.

#### 5.8.3 REFSENS requirements for DC

Analysis of REFSENS exceptions or MSD requirements is needed due to higher power UL DC. Based on co-existence studies of DC\_1\_n78 and DC\_1\_n79 captured in TR 37.863-01-01 [2], own Rx impact of the 3rd band is the followings.

* the 3rd and 5th order IMD generated by dual uplink of band 1 and band n78 may also fall into own Rx of band n79.
* the 5th order IMD generated by dual uplink of band 1 and band n79 may also fall into own Rx of band n78.

For MSD due to 3rd order IMD generated by dual uplink of band 1 and band n78, the MSD value can be seen as dB related to 1st order proportional of band 1 UL power + 2nd order proportional of band n78 UL power. PC3 DC is assumed to be 20dBm+20dBm and PC2 DC is assumed to be 23dBm+23dBm. Therefore, MSD value of PC2 case will be 9dB higher than that of PC3 case. New MSD value is shown in Table 5.8.3-1 below.

Also, For MSD due to 5th order IMD generated by dual uplink of band 1 and band n79, the MSD value can be seen as dB related to 4th order proportional of band 1 UL power + 1st order proportional of band n79 UL power. PC3 DC is assumed to be 20dBm+20dBm and PC2 DC is assumed to be 23dBm+23dBm. In addition, PSD will be 6dB higher when UL CBW of n79 is changed from 40MHz to 10MHz. Therefore, MSD value of PC2 case will be 18dB higher than that of PC3 case. New MSD value is shown in Table 5.8.3-1 below.

Table 5.8.3-1: MSD test points for Scell due to dual uplink operation for EN-DC in NR FR1 (three bands)

| NR or E-UTRA Band / Channel bandwidth / NRB / MSD | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- |
| EN-DC Configuration | EUTRA / NR band | UL Fc  (MHz) | UL/DL BW  (MHz) | UL  LCRB | DL Fc (MHz) | MSD  (dB) | IMD order |
| DC\_1A\_n78A-n79A | 1 | 1950 | 5 | 25 | 2140 | N/A | N/A |
|  | n78 | 3410 | 10 | 50 | 3410 | N/A | N/A |
|  | n79 | 4870 | 10 | 50 | 4870 | 24.9 | IMD31 |
|  | 1 | 1950 | 5 | 25 | 2140 | N/A | N/A |
|  | n78 | 3490 | 10 | 50 | 3490 | 22.6 | IMD5 |
|  | n79 | 4670 | 10 | 50 | 4670 | N/A | N/A |
| NOTE 1: This band is subject to IMD5 also which MSD is not specified. | | | | | | | |

#### 5.8.4 ∆TIB and ∆RIB values

There is no change by comparing to the values for PC3 DC, so this section is omitted.

### 5.9 DC\_3\_n78-n79

#### 5.9.1 Configuration for DC

Table 5.9.1-1: Inter-band EN-DC configurations within FR1 (three bands)

| **EN-DC**  **configuration** | **Uplink EN-DC**  **configuration**  **(NOTE 1)** |
| --- | --- |
| DC\_3A\_n78A-n79A14,X | DC\_3A\_n78A14  DC\_3A\_n79A14 |
| NOTE 1: Uplink EN-DC configurations are the configurations supported by the present release of specifications.  NOTE 14: PC3 or PC2 Uplink EN-DC configuration is applicable to EN-DC configurations.  NOTE X: For UEs supporting band n77, the minimum requirements apply only when there is non-simultaneous Rx/Tx operation between n78-n79 NR carriers. This restriction applies also for these carriers when applicable EN-DC configuration is part of a higher order configuration. | |

#### 5.9.2 Maximum output power for DC

Based on studies of PC2 DC\_3\_n78 and PC2 DC\_3\_n79, this section can be omitted.

#### 5.9.3 REFSENS requirements for DC

Analysis of REFSENS exceptions or MSD requirements is needed due to higher power UL DC. Based on co-existence studies of DC\_3\_n78 and DC\_3\_n79 captured in TR 37.863-01-01 [2], own Rx impact of the 3rd band is the followings.

* the 3rd order IMD generated by dual uplink of band 3 and band n78 may also fall into own Rx of band n79.
* the 5th order IMD generated by dual uplink of band 3 and band n79 may also fall into own Rx of band n78.

For MSD due to 3rd order IMD generated by dual uplink of band 3 and band n78, the MSD value can be seen as dB related to 1st order proportional of band 3 UL power + 2nd order proportional of band n78 UL power. PC3 DC is assumed to be 20dBm+20dBm and PC2 DC is assumed to be 23dBm+23dBm. Therefore, MSD value of PC2 case will be 9dB higher than that of PC3 case. New MSD value is shown in Table 5.9.3-1 below.

Also, For MSD due to 5th order IMD generated by dual uplink of band 1 and band n79, the MSD value can be seen as dB related to 3rd order proportional of band 1 UL power + 2nd order proportional of band n79 UL power. PC3 DC is assumed to be 20dBm+20dBm and PC2 DC is assumed to be 23dBm+23dBm. In addition, PSD will be 6dB higher when UL CBW of n79 is changed from 40MHz to 10MHz. Therefore, MSD value of PC2 case will be 21dB higher than that of PC3 case. New MSD value is shown in Table 5.9.3-1 below.

Table 5.9.3-1: MSD test points for Scell due to dual uplink operation for EN-DC in NR FR1 (three bands)

| NR or E-UTRA Band / Channel bandwidth / NRB / MSD | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- |
| EN-DC Configuration | EUTRA / NR band | UL Fc  (MHz) | UL/DL BW  (MHz) | UL  LCRB | DL Fc (MHz) | MSD  (dB) | IMD order |
| DC\_3A\_n78A-n79A | 3 | 1770 | 5 | 25 | 1865 | N/A | N/A |
|  | n78 | 3340 | 10 | 50 | 3340 | N/A | N/A |
|  | n79 | 4910 | 10 | 50 | 4910 | 25.3 | IMD3 |
|  | 3 | 1770 | 5 | 25 | 1865 | N/A | N/A |
|  | n78 | 3710 | 10 | 50 | 3710 | 25.2 | IMD5 |
|  | n79 | 4510 | 10 | 50 | 4510 | N/A | N/A |

#### 5.9.4 ∆TIB and ∆RIB values

There is no change by comparing to the values for PC3 DC, so this section is omitted.

### 5.10 DC\_21\_n78-n79

#### 5.10.1 Configuration for DC

Table 5.10.1-1: Inter-band EN-DC configurations within FR1 (three bands)

| **EN-DC**  **configuration** | **Uplink EN-DC**  **configuration**  **(NOTE 1)** |
| --- | --- |
| DC\_21A\_n78A-n79A14,X | DC\_21A\_n78A14  DC\_21A\_n79A14 |
| NOTE 1: Uplink EN-DC configurations are the configurations supported by the present release of specifications.  NOTE 14: PC3 or PC2 Uplink EN-DC configuration is applicable to EN-DC configurations.  NOTE X: For UEs supporting band n77, the minimum requirements apply only when there is non-simultaneous Rx/Tx operation between n78-n79 NR carriers. This restriction applies also for these carriers when applicable EN-DC configuration is part of a higher order configuration. | |

#### 5.10.2 Maximum output power for DC

Based on studies of PC2 DC\_21\_n78 and PC2 DC\_21\_n79, this section can be omitted.

#### 5.10.3 REFSENS requirements for DC

Analysis of REFSENS exceptions or MSD requirements is needed due to higher power UL DC. Based on co-existence studies of DC\_21\_n78 and DC\_21\_n79 captured in TR 37.863-01-01 [2], own Rx impact of the 3rd band is the followings.

* the 2nd and 4th order IMD generated by dual uplink of band 21 and band n78 may also fall into own Rx of band n79.
* the 2nd order IMD generated by dual uplink of band 21 and band n79 may also fall into own Rx of band n78.

For MSD due to 2nd order IMD generated by dual uplink of band 21 and band n78, the MSD value can be seen as dB related to 1st order proportional of band 21 UL power + 1st order proportional of band n78 UL power. PC3 DC is assumed to be 20dBm+20dBm and PC2 DC is assumed to be 23dBm+23dBm. Therefore, MSD value of PC2 case will be 6dB higher than that of PC3 case. New MSD value is shown in Table 5.10.3-1 below.

Also, For MSD due to 2nd order IMD generated by dual uplink of band 21 and band n79, the MSD value can be seen as dB related to 1st order proportional of band 21 UL power + 1st order proportional of band n79 UL power. PC3 DC is assumed to be 20dBm+20dBm and PC2 DC is assumed to be 23dBm+23dBm. In addition, PSD will be 6dB higher when UL CBW of n79 is changed from 40MHz to 10MHz. Therefore, MSD value of PC2 case will be 9dB higher than that of PC3 case. New MSD value is shown in Table 5.10.3-1 below.

Table 5.10.3-1: MSD test points for Scell due to dual uplink operation for EN-DC in NR FR1 (three bands)

| NR or E-UTRA Band / Channel bandwidth / NRB / MSD | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- |
| EN-DC Configuration | EUTRA / NR band | UL Fc  (MHz) | UL/DL BW  (MHz) | UL  LCRB | DL Fc (MHz) | MSD  (dB) | IMD order |
| DC\_21A\_n78A-n79A | 21 | 1453 | 5 | 25 | 1501 | N/A | N/A |
|  | n78 | 3420 | 10 | 50 | 3420 | N/A | N/A |
|  | n79 | 4873 | 10 | 50 | 4873 | 36.1 | IMD25 |
|  | 21 | 1453 | 5 | 25 | 1501 | N/A | N/A |
|  | n78 | 3487 | 10 | 50 | 3487 | 38.8 | IMD2 |
|  | n79 | 4940 | 10 | 50 | 4940 | N/A | N/A |
| NOTE 5: This band is subject to IMD4 also which MSD is not specified. | | | | | | | |

#### 5.10.4 ∆TIB and ∆RIB values

There is no change by comparing to the values for PC3 DC, so this section is omitted.

### 5.11 DC\_1-21\_n77

#### 5.11.1 Configuration for DC

Table 5.11.1-1: Inter-band EN-DC configurations within FR1 (three bands)

| **EN-DC**  **configuration** | **Uplink EN-DC**  **configuration**  **(NOTE 1)** |
| --- | --- |
| DC\_1A-21A\_n77A5,14 | DC\_1A\_n77A14  DC\_21A\_n77A14 |
| NOTE 1: Uplink EN-DC configurations are the configurations supported by the present release of specifications.  NOTE 5: Applicable for UE supporting inter-band EN-DC with mandatory simultaneous Rx/Tx capability  NOTE 14: PC3 or PC2 Uplink EN-DC configuration is applicable to EN-DC configurations. | |

#### 5.11.2 Maximum output power for DC

Based on studies of PC2 DC\_1\_n77 and PC2 DC\_21\_n77, this section can be omitted.

#### 5.11.3 REFSENS requirements for DC

Analysis of REFSENS exceptions or MSD requirements is needed due to higher power UL DC. Based on co-existence studies of DC\_1\_n77 and DC\_21\_n77 captured in TR 37.863-01-01 [2], own Rx impact of the 3rd band is the followings.

* the 2nd and 5th order IMD generated by dual uplink of band 1 and band n77 may also fall into own Rx of band 21.
* the 2nd and 5th order IMD generated by dual uplink of band 21 and band n77 may also fall into own Rx of band 1.

Considering that Band 21 is currently operated only by a certain operator in Japan, the frequency range can be limited as Band 1 UL/DL = 1940-1960/2130-2150 MHz and Band n77 UL/DL = 3600-4200/3600-4200 MHz. Then own Rx impact can be simplified as below.

* the 5th order IMD generated by dual uplink of band 1 and band n77 may also fall into own Rx of band 21.
* the 2nd and 5th order IMD generated by dual uplink of band 21 and band n77 may also fall into own Rx of band 1.

For MSD due to 5th order IMD generated by dual uplink of band 1 and band n77, the MSD value can be seen as dB related to 3rd order proportional of band 1 UL power + 2nd order proportional of band n77 UL power. PC3 DC is assumed to be 20dBm+20dBm and PC2 DC is assumed to be 23dBm+23dBm. Therefore, MSD value of PC2 case will be 15dB higher than that of PC3 case. New MSD value is shown in Table 5.11.3-1 below.

Also, For MSD due to 2nd order IMD generated by dual uplink of band 21 and band n77, the MSD value can be seen as dB related to 1st order proportional of band 21 UL power + 1st order proportional of band n77 UL power. PC3 DC is assumed to be 20dBm+20dBm and PC2 DC is assumed to be 23dBm+23dBm. Therefore, MSD value of PC2 case will be 6dB higher than that of PC3 case. New MSD value is shown in Table 5.11.3-1 below.

Table 5.11.3-1: MSD test points for Scell due to dual uplink operation for EN-DC in NR FR1 (three bands)

| NR or E-UTRA Band / Channel bandwidth / NRB / MSD | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- |
| EN-DC Configuration | EUTRA / NR band | UL Fc  (MHz) | UL/DL BW  (MHz) | UL  LCRB | DL Fc (MHz) | MSD  (dB) | IMD order |
| DC\_1A-21A\_n77A | 1 | N/A | N/A | N/A | N/A | N/A | N/A |
|  | 21 | N/A | N/A | N/A | N/A | N/A | IMD2 |
|  | n77 | N/A | N/A | N/A | N/A | N/A | N/A |
|  | 1 | 1950 | 5 | 25 | 2140 | N/A | N/A |
|  | 21 | 1452 | 5 | 25 | 1500 | 17.9 | IMD5 |
|  | n77 | 3605 | 10 | 50 | 3605 | N/A | N/A |
|  | 1 | 1964.6 | 5 | 25 | 2154.6 | 36.6 | IMD21 |
|  | 21 | 1450.4 | 5 | 25 | 1498.4 | N/A | N/A |
|  | n77 | 3605 | 10 | 50 | 3605 | N/A | N/A |
| NOTE 1: This band is subject to IMD5 also which MSD is not specified. | | | | | | | |

#### 5.11.4 ∆TIB and ∆RIB values

There is no change by comparing to the values for PC3 DC, so this section is omitted.

### 5.12 DC\_1-42\_n77

#### 5.12.1 Configuration for DC

Table 5.12.1-1: Inter-band EN-DC configurations within FR1 (three bands)

| **EN-DC**  **configuration** | **Uplink EN-DC**  **configuration**  **(NOTE 1)** |
| --- | --- |
| DC\_1A-42A\_n77A14,15,16  DC\_1A-42C\_n77A14,15,16  DC\_1A-42D\_n77A14,15,16  DC\_1A-42E\_n77A14,15,16 | DC\_1A\_n77A14 |
| NOTE 1: Uplink EN-DC configurations are the configurations supported by the present release of specifications.  NOTE 14: PC3 or PC2 Uplink EN-DC configuration is applicable to EN-DC configurations.  NOTE 15: For UEs not indicating *interBandMRDC-WithOverlapDL-Bands-r16*, the minimum requirements for intra-band non-contiguous EN-DC apply for the Band 42/48 and Band n77/n78 combination and for the Band 2 and Band n25 combinations. For UEs not indicating *interBandMRDC-WithOverlapDL-Bands-r16*, when UE capability *interBandContiguousMRDC* is indicated, the minimum requirements for intra-band-contiguous EN-DC also should be met in addtion to intra-band non-contiguous EN-DC*.*  NOTE 16: For UEs not indicating *interBandMRDC-WithOverlapDL-Bands-r16*, the minimum requirements for inter-band EN-DC apply when the maximum power spectral density imbalance between downlink carriers contained in overlapping or partially overlapping DL bands is within 6 dB. | |

#### 5.12.2 Maximum output power for DC

Based on studies of PC2 DC\_1\_n77, this section can be omitted.

#### 5.12.3 REFSENS requirements for DC

Analysis of REFSENS exceptions or MSD requirements is needed due to higher power UL DC. Based on co-existence studies of DC\_1\_n77 captured in TR 37.863-01-01 [2], own Rx impact of the 3rd band is the followings.

* the 4th and 5th order IMD generated by dual uplink of band 1 and band n77 may also fall into own Rx of band 42.

However, IMD will not be an issue because there is non-simultaneous Rx/Tx operation between band 42 and band n77. Therefore, there is no MSD issue for this DC configuration.

#### 5.12.4 ∆TIB and ∆RIB values

There is no change by comparing to the values for PC3 DC, so this section is omitted.

### 5.13 DC\_3-21\_n77

#### 5.13.1 Configuration for DC

Table 5.13.1-1: Inter-band EN-DC configurations within FR1 (three bands)

| **EN-DC**  **configuration** | **Uplink EN-DC**  **configuration**  **(NOTE 1)** |
| --- | --- |
| DC\_3A-21A\_n77A5,14 | DC\_3A\_n77A14  DC\_21A\_n77A14 |
| NOTE 1: Uplink EN-DC configurations are the configurations supported by the present release of specifications.  NOTE 5: Applicable for UE supporting inter-band EN-DC with mandatory simultaneous Rx/Tx capability  NOTE 14: PC3 or PC2 Uplink EN-DC configuration is applicable to EN-DC configurations. | |

#### 5.13.2 Maximum output power for DC

Based on studies of PC2 DC\_3\_n77 and PC2 DC\_21\_n77, this section can be omitted.

#### 5.13.3 REFSENS requirements for DC

Analysis of REFSENS exceptions or MSD requirements is needed due to higher power UL DC. Based on co-existence studies of DC\_3\_n77 and DC\_21\_n77 captured in TR 37.863-01-01 [2], own Rx impact of the 3rd band is the followings.

* the 4th and 5th order IMD generated by dual uplink of band 3 and band n77 may also fall into own Rx of band 21.
* the 2nd and 5th order IMD generated by dual uplink of band 21 and band n77 may also fall into own Rx of band 3.

Considering that Band 21 is currently operated only by a certain operator in Japan, the frequency range can be limited as Band n77 UL/DL = 3600-4200/3600-4200 MHz. Therefore, own Rx impact can be simplified as below.

* the 4th order IMD generated by dual uplink of band 3 and band n77 may also fall into own Rx of band 21.
* the 5th order IMD generated by dual uplink of band 21 and band n77 may also fall into own Rx of band 3.

For MSD due to 4th order IMD generated by dual uplink of band 3 and band n77, the MSD value can be seen as dB related to 3rd order proportional of band 3 UL power + 1st order proportional of band n77 UL power. PC3 DC is assumed to be 20dBm+20dBm and PC2 DC is assumed to be 23dBm+23dBm. Therefore, MSD value of PC2 case will be 12dB higher than that of PC3 case. New MSD value is shown in Table 5.13.3-1 below.

Also, For MSD due to 5th order IMD generated by dual uplink of band 21 and band n77, the MSD value can be seen as dB related to 4th order proportional of band 21 UL power + 1st order proportional of band n77 UL power. PC3 DC is assumed to be 20dBm+20dBm and PC2 DC is assumed to be 23dBm+23dBm. Therefore, MSD value of PC2 case will be 15dB higher than that of PC3 case. New MSD value is shown in Table 5.13.3-1 below.

Table 5.13.3-1: MSD test points for Scell due to dual uplink operation for EN-DC in NR FR1 (three bands)

| NR or E-UTRA Band / Channel bandwidth / NRB / MSD | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- |
| EN-DC Configuration | EUTRA / NR band | UL Fc  (MHz) | UL/DL BW  (MHz) | UL  LCRB | DL Fc (MHz) | MSD  (dB) | IMD order |
| DC\_3A-21A\_n77A | 3 | 1767.5 | 5 | 25 | 1862.5 | N/A | N/A |
|  | 21 | 1459.5 | 5 | 25 | 1507.5 | 20.8 | IMD4 |
|  | n77 | 3795 | 10 | 50 | 3795 | N/A | N/A |
|  | 3 | N/A | N/A | N/A | N/A | N/A | IMD2 |
|  | 21 | N/A | N/A | N/A | N/A | N/A | N/A |
|  | n77 | N/A | N/A | N/A | N/A | N/A | N/A |
|  | 3 | 1771.6 | 5 | 25 | 1866.6 | 18.4 | IMD5 |
|  | 21 | 1450.4 | 5 | 25 | 1498.4 | N/A | N/A |
|  | n77 | 3935 | 10 | 50 | 3935 | N/A | N/A |

#### 5.13.4 ∆TIB and ∆RIB values

There is no change by comparing to the values for PC3 DC, so this section is omitted.

### 5.14 DC\_3-42\_n77

#### 5.14.1 Configuration for DC

Table 5.14.1-1: Inter-band EN-DC configurations within FR1 (three bands)

| **EN-DC**  **configuration** | **Uplink EN-DC**  **configuration**  **(NOTE 1)** |
| --- | --- |
| DC\_3A-42A\_n77A14,15,16  DC\_3A-42C\_n77A14,15,16  DC\_3A-42D\_n77A14,15,16  DC\_3A-42E\_n77A14,15,16 | DC\_3A\_n77A14 |
| NOTE 1: Uplink EN-DC configurations are the configurations supported by the present release of specifications.  NOTE 14: PC3 or PC2 Uplink EN-DC configuration is applicable to EN-DC configurations.  NOTE 15: For UEs not indicating *interBandMRDC-WithOverlapDL-Bands-r16*, the minimum requirements for intra-band non-contiguous EN-DC apply for the Band 42/48 and Band n77/n78 combination and for the Band 2 and Band n25 combinations. For UEs not indicating *interBandMRDC-WithOverlapDL-Bands-r16*, when UE capability *interBandContiguousMRDC* is indicated, the minimum requirements for intra-band-contiguous EN-DC also should be met in addtion to intra-band non-contiguous EN-DC*.*  NOTE 16: For UEs not indicating *interBandMRDC-WithOverlapDL-Bands-r16*, the minimum requirements for inter-band EN-DC apply when the maximum power spectral density imbalance between downlink carriers contained in overlapping or partially overlapping DL bands is within 6 dB. | |

#### 5.14.2 Maximum output power for DC

Based on studies of PC2 DC\_3\_n77, this section can be omitted.

#### 5.14.3 REFSENS requirements for DC

Analysis of REFSENS exceptions or MSD requirements is needed due to higher power UL DC. Based on co-existence studies of DC\_3\_n77 captured in TR 37.863-01-01 [2], own Rx impact of the 3rd band is the followings.

* the 4th and 5th order IMD generated by dual uplink of band 3 and band n77 may also fall into own Rx of band 42.

However, IMD will not be an issue because there is non-simultaneous Rx/Tx operation between band 42 and band n77. Therefore, there is no MSD issue for this DC configuration.

#### 5.14.4 ∆TIB and ∆RIB values

There is no change by comparing to the values for PC3 DC, so this section is omitted.

### 5.15 DC\_21-42\_n77

#### 5.15.1 Configuration for DC

Table 5.15.1-1: Inter-band EN-DC configurations within FR1 (three bands)

| **EN-DC**  **configuration** | **Uplink EN-DC**  **configuration**  **(NOTE 1)** |
| --- | --- |
| DC\_21A-42A\_n77A14,15,16  DC\_21A-42C\_n77A14,15,16 | DC\_21A\_n77A14 |
| NOTE 1: Uplink EN-DC configurations are the configurations supported by the present release of specifications.  NOTE 14: PC3 or PC2 Uplink EN-DC configuration is applicable to EN-DC configurations.  NOTE 15: For UEs not indicating *interBandMRDC-WithOverlapDL-Bands-r16*, the minimum requirements for intra-band non-contiguous EN-DC apply for the Band 42/48 and Band n77/n78 combination and for the Band 2 and Band n25 combinations. For UEs not indicating *interBandMRDC-WithOverlapDL-Bands-r16*, when UE capability *interBandContiguousMRDC* is indicated, the minimum requirements for intra-band-contiguous EN-DC also should be met in addtion to intra-band non-contiguous EN-DC*.*  NOTE 16: For UEs not indicating *interBandMRDC-WithOverlapDL-Bands-r16*, the minimum requirements for inter-band EN-DC apply when the maximum power spectral density imbalance between downlink carriers contained in overlapping or partially overlapping DL bands is within 6 dB. | |

#### 5.15.2 Maximum output power for DC

Based on studies of PC2 DC\_21\_n77, this section can be omitted.

#### 5.15.3 REFSENS requirements for DC

Analysis of REFSENS exceptions or MSD requirements is needed due to higher power UL DC. Based on co-existence studies of DC\_21\_n77 captured in TR 37.863-01-01 [2], own Rx impact of the 3rd band is the followings.

* the 5th order IMD generated by dual uplink of band 21 and band n77 may also fall into own Rx of band 42.

However, IMD will not be an issue because there is non-simultaneous Rx/Tx operation between band 42 and band n77. Therefore, there is no MSD issue for this DC configuration.

#### 5.15.4 ∆TIB and ∆RIB values

There is no change by comparing to the values for PC3 DC, so this section is omitted.

### 5.16 DC\_1\_n77

#### 5.16.1 Configuration for DC

When requested EN-DC configuration is 2DL2UL, it is not needed to update the inter-band EN-DC configuration table. By referring to the maximum output power table, it can be checked whether these configurations support PC2. This band combination for PC3 is already specified in TS 38.101-3 [2], so this section is omitted.

#### 5.16.2 Maximum output power for DC

**Table 5.16.2-1:** **Maximum output power for inter-band EN-DC (two bands)**

| EN-DC configuration | Power class 2  (dBm) | Tolerance  (dB) | Power class 3  (dBm) | Tolerance  (dB) |
| --- | --- | --- | --- | --- |
| DC\_1A\_n77A | 266,8 | +2/-3 | 23 | +2/-3 |
| NOTE 6: The UE supports PC3 within E-UTRA cell group, and supports either PC3 or PC2 within NR cell group. Power class support within each individual cell group is signaled separately by the UE.  NOTE 8: The UE that supports PC3 within a TDD or FDD band and supports PC2 within a second TDD band may signal a [HigherPowerLimitCADC] capability whereby the maximum output power indicated in the table may be exceeded in accordance with sub-clause 6.2B.4.1.3. | | | | |

#### 5.16.3 REFSENS requirements for DC

Analysis of REFSENS exceptions or MSD requirements is needed due to higher power UL DC. For PC3 DC\_1\_n77, the co-existence study is provided in TR 37.863-01-01 [3]. Based on above,

* the 2nd, 4th, and 5th order IMD may impact the Rx frequencies of band 1.
* the 4th and 5th order IMD may impact the Rx frequencies of band n77.
* the 2nd, 3rd, 4th, and 5th order harmonic from PC2 UL band n77 do not fall into Rx frequencies of band 1.
* the 2nd, 3rd, 4th, and 5th order harmonic mixing from PC2 UL band n77 do not impact the Rx frequencies of band 1.
* the 3rd order IMD do not impact the Rx frequencies of band 1.
* the 2nd and 3rd order IMD do not impact the Rx frequencies of band n77.

It should be noted that IMD will not be an issue for band n77 (no self-interference for the TDD band) even through the IMD products may impact the concerning band.

For MSD due to 2nd order IMD, the MSD value can be seen as dB related to 1st order proportional of band 1 UL power + 1st order proportional of band n77 UL power. PC3 DC is assumed to be 20dBm+20dBm and PC2 DC is assumed to be 23dBm+23dBm. Therefore, MSD value of PC2 case will be 6dB higher than that of PC3 case.

For MSD due to 4th order IMD, MSD value for PC2 DC\_1A\_n77A can reuse the value for PC2 DC\_1A\_n78A already specified in TS 38.101-3.

New MSD values are shown in Table 5.16.3-1 below.

**Table 5.16.3-1: MSD test points for PCell due to dual uplink operation for PC2 EN-DC in NR FR1 (two bands)**

| NR or E-UTRA Band / Channel bandwidth / NRB / MSD | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- |
| EN-DC  Configuration | EUTRA or NR band | UL Fc  (MHz) | UL/DL BW  (MHz) | UL  LCRB | DL Fc (MHz) | MSD  (dB) | IMD order |
| DC\_1A\_n77A | 1 | 1950 | 5 | 25 | 2140 | 35.8 | IMD21 |
|  | n77 | 4090 | 10 | 50 | 4090 | N/A | N/A |
|  | 1 | 1950 | 5 | 25 | 2140 | 17.8 | IMD41 |
|  | n77 | 3710 | 10 | 50 | 3710 | N/A | N/A |
| NOTE 1: This band is subject to IMD5 also which MSD is not specified. | | | | | | | |

#### 5.16.4 ∆TIB and ∆RIB values

There is no change by comparing to the values for PC3 DC, so this section is omitted.

### 5.17 DC\_3\_n77

#### 5.17.1 Configuration for DC

When requested EN-DC configuration is 2DL2UL, it is not needed to update the inter-band EN-DC configuration table. By referring to the maximum output power table, it can be checked whether these configurations support PC2. This band combination for PC3 is already specified in TS 38.101-3 [2], so this section is omitted.

#### 5.17.2 Maximum output power for DC

**Table 5.17.2-1:** **Maximum output power for inter-band EN-DC (two bands)**

| EN-DC configuration | Power class 2  (dBm) | Tolerance  (dB) | Power class 3  (dBm) | Tolerance  (dB) |
| --- | --- | --- | --- | --- |
| DC\_3A\_n77A | 266,8 | +2/-3 | 23 | +2/-3 |
| NOTE 6: The UE supports PC3 within E-UTRA cell group, and supports either PC3 or PC2 within NR cell group. Power class support within each individual cell group is signaled separately by the UE.  NOTE 8: The UE that supports PC3 within a TDD or FDD band and supports PC2 within a second TDD band may signal a [HigherPowerLimitCADC] capability whereby the maximum output power indicated in the table may be exceeded in accordance with sub-clause 6.2B.4.1.3. | | | | |

#### 5.17.3 REFSENS requirements for DC

Analysis of REFSENS exceptions or MSD requirements is needed due to higher power UL DC. For PC3 DC\_3\_n77, the co-existence study is provided in TR 37.863-01-01 [3]. Based on above,

* the 2nd order harmonic mixing from PC2 UL band n77 may impact the Rx frequencies of band 3.
* the 2nd, 4th and 5th order IMD may impact the Rx frequencies of band 3.
* the 4th and 5th order IMD may impact the Rx frequencies of band n77.
* the 2nd, 3rd, 4th, and 5th order harmonic from PC2 UL band n77 do not fall into Rx frequencies of band 3.
* the 3rd, 4th, and 5th order harmonic mixing from PC2 UL band n77 do not impact the Rx frequencies of band 3.
* the 3rd order IMD do not impact the Rx frequencies of band 3.
* the 2nd and 3rd order IMD do not impact the Rx frequencies of band n77.

It should be noted that IMD will not be an issue for band n77 (no self-interference for the TDD band) even through the IMD products may impact the concerning band.

For MSD due to 2nd order harmonic mixing, MSD value of PC2 case will be 3dB higher than that of PC3 case. However, the MSD value is updated to match re-analysed value in R4-2301133 [4] when the channel bandwidth of UL n77 is 5MHz. New MSD values are shown in Table 5.17.3-1 below. Uplink configuration is shown in Table 5.17.3-2 below.

For MSD due to 2nd order IMD and 4th order IMD, MSD values for PC2 DC\_3A\_n77A can reuse the values for PC2 DC\_3A\_n78A already specified in TS 38.101-3. MSD value is shown in Table 5.17.3-3 below.

Table 5.17.3-1: Reference sensitivity exceptions (MSD) due to receiver harmonic mixing for PC2 EN-DC in NR FR1

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| E-UTRA or 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) | 40 MHz  (dB) | 50 MHz  (dB) | 60 MHz  (dB) | 80 MHz  (dB) | 90 MHz  (dB) | 100 MHz  (dB) |
| n77 | 3 | 8.1 | 7.0 | 6.0 | 5.7 |  |  |  |  |  |  |  |

Table 5.17.3-2: Uplink configuration for reference sensitivity exceptions due to receiver harmonic mixing for EN-DC in NR FR1

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| E-UTRA or NR Band / SCS / Channel bandwidth of the affected DL band / UL RB allocation of the agressor band | | | | | | | | | | | | | |
| UL band | DL band | SCS of UL band  (kHz) | 5 MHz  (LCRB) | 10 MHz  (LCRB) | 15 MHz  (LCRB) | 20 MHz  (LCRB) | 25 MHz  (LCRB) | 40 MHz  (LCRB) | 50 MHz  (LCRB) | 60 MHz  (LCRB) | 80 MHz  (LCRB) | 90 MHz  (LCRB) | 100 MHz  (LCRB) |
| n77 | 3 | 15 | 25 | 50 | 75 | 100 |  |  |  |  |  |  |  |

**Table 5.17.3-3: MSD test points for PCell due to dual uplink operation for PC2 EN-DC in NR FR1 (two bands)**

| NR or E-UTRA Band / Channel bandwidth / NRB / MSD | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- |
| EN-DC  Configuration | EUTRA or NR band | UL Fc  (MHz) | UL/DL BW  (MHz) | UL  LCRB | DL Fc (MHz) | MSD  (dB) | IMD order |
| DC\_3A\_n77A | 3 | 1740 | 5 | 25 | 1835 | 31.9 | IMD21 |
|  | n77 | 3575 | 10 | 50 | 3575 | N/A | N/A |
|  | 3 | 1765 | 5 | 25 | 1860 | 18.5 | IMD41 |
|  | n77 | 3435 | 10 | 50 | 3435 | N/A | N/A |
| NOTE 1: This band is subject to IMD5 also which MSD is not specified. | | | | | | | |

#### 5.17.4 ∆TIB and ∆RIB values

There is no change by comparing to the values for PC3 DC, so this section is omitted.

### 5.18 DC\_21\_n77

#### 5.18.1 Configuration for DC

When requested EN-DC configuration is 2DL2UL, it is not needed to update the inter-band EN-DC configuration table. By referring to the maximum output power table, it can be checked whether these configurations support PC2. This band combination for PC3 is already specified in TS 38.101-3 [2], so this section is omitted.

#### 5.18.2 Maximum output power for DC

**Table 5.18.2-1:** **Maximum output power for inter-band EN-DC (two bands)**

| EN-DC configuration | Power class 2  (dBm) | Tolerance  (dB) | Power class 3  (dBm) | Tolerance  (dB) |
| --- | --- | --- | --- | --- |
| DC\_21A\_n77A | 266,8 | +2/-3 | 23 | +2/-3 |
| NOTE 6: The UE supports PC3 within E-UTRA cell group, and supports either PC3 or PC2 within NR cell group. Power class support within each individual cell group is signaled separately by the UE.  NOTE 8: The UE that supports PC3 within a TDD or FDD band and supports PC2 within a second TDD band may signal a [HigherPowerLimitCADC] capability whereby the maximum output power indicated in the table may be exceeded in accordance with sub-clause 6.2B.4.1.3. | | | | |

#### 5.18.3 REFSENS requirements for DC

Analysis of REFSENS exceptions or MSD requirements is needed due to higher power UL DC. For PC3 DC\_21\_n77, the co-existence study is provided in TR 37.863-01-01 [3]. Based on above,

* the 4th and 5th order IMD may impact the Rx frequencies of band n77.
* the 2nd, 3rd, 4th, and 5th order harmonic from PC2 UL band n77 do not fall into Rx frequencies of band 21.
* the 2nd, 3rd, 4th, and 5th order harmonic mixing from PC2 UL band n77 do not impact the Rx frequencies of band 21.
* the 2nd, 3rd, 4th, and 5th order IMD do not impact the Rx frequencies of band 21.
* the 2nd and 3rd order IMD do not impact the Rx frequencies of band n77.

It should be noted that IMD will not be an issue for band n77 (no self-interference for the TDD band) even through the IMD products may impact the concerning band. Therefore, there is no MSD issue for this DC configuration.

#### 5.18.4 ∆TIB and ∆RIB values

There is no change by comparing to the values for PC3 DC, so this section is omitted.

### 5.19 DC\_21\_n78

#### 5.19.1 Configuration for DC

When requested EN-DC configuration is 2DL2UL, it is not needed to update the inter-band EN-DC configuration table. By referring to the maximum output power table, it can be checked whether these configurations support PC2. This band combination for PC3 is already specified in TS 38.101-3 [2], so this section is omitted.

#### 5.19.2 Maximum output power for DC

**Table 5.19.2-1:** **Maximum output power for inter-band EN-DC (two bands)**

| EN-DC configuration | Power class 2  (dBm) | Tolerance  (dB) | Power class 3  (dBm) | Tolerance  (dB) |
| --- | --- | --- | --- | --- |
| DC\_21A\_n78A | 266,8 | +2/-3 | 23 | +2/-3 |
| NOTE 6: The UE supports PC3 within E-UTRA cell group, and supports either PC3 or PC2 within NR cell group. Power class support within each individual cell group is signaled separately by the UE.  NOTE 8: The UE that supports PC3 within a TDD or FDD band and supports PC2 within a second TDD band may signal a [HigherPowerLimitCADC] capability whereby the maximum output power indicated in the table may be exceeded in accordance with sub-clause 6.2B.4.1.3. | | | | |

#### 5.19.3 REFSENS requirements for DC

Analysis of REFSENS exceptions or MSD requirements is needed due to higher power UL DC. For PC3 DC\_21\_n78, the co-existence study is provided in TR 37.863-01-01 [3]. Based on above,

* the 4th order IMD may impact the Rx frequencies of band n78.
* the 2nd, 3rd, 4th, and 5th order harmonic from PC2 UL band n78 do not fall into Rx frequencies of band 21.
* the 2nd, 3rd, 4th, and 5th order harmonic mixing from PC2 UL band n78 do not impact the Rx frequencies of band 21.
* the 2nd, 3rd, 4th, and 5th order IMD do not impact the Rx frequencies of band 21.
* the 2nd, 3rd, and 5th order IMD do not impact the Rx frequencies of band n78.

It should be noted that IMD will not be an issue for band n78 (no self-interference for the TDD band) even through the IMD products may impact the concerning band. Therefore, there is no MSD issue for this DC configuration.

#### 5.19.4 ∆TIB and ∆RIB values

There is no change by comparing to the values for PC3 DC, so this section is omitted.

### 5.20 DC\_1-3\_n77

#### 5.20.1 Configuration for DC

Table 5.20.1-1: Inter-band EN-DC configurations within FR1 (three bands)

| **EN-DC**  **configuration** | **Uplink EN-DC**  **configuration**  **(NOTE 1)** |
| --- | --- |
| DC\_1A-3A\_n77A5,14 | DC\_1A\_n77A14  DC\_3A\_n77A14 |
| NOTE 1: Uplink EN-DC configurations are the configurations supported by the present release of specifications.  NOTE 5: Applicable for UE supporting inter-band EN-DC with mandatory simultaneous Rx/Tx capability  NOTE 14: PC3 or PC2 Uplink EN-DC configuration is applicable to EN-DC configurations. | |

#### 5.20.2 Maximum output power for DC

Based on studies of PC2 DC\_1\_n77 and PC2 DC\_3\_n77, this section can be omitted.

#### 5.20.3 REFSENS requirements for DC

Analysis of REFSENS exceptions or MSD requirements is needed due to higher power UL DC. Based on co-existence studies of DC\_1\_n77 and DC\_3\_n77 captured in TR 37.863-01-01 [2], own Rx impact of the 3rd band is the followings.

* the 2nd, 4th, and 5th order IMD generated by dual uplink of band 1 and band n77 may also impact the own Rx of band 3.
* the 2nd and 5th order IMD generated by dual uplink of band 3 and band n77 may also impact the own Rx of band 1.

For MSD due to 2nd order IMD generated by dual uplink of band 1 and band n77, the MSD value can be seen as dB related to 1st order proportional of band 1 UL power + 1st order proportional of band n77 UL power. PC3 DC is assumed to be 20dBm+20dBm and PC2 DC is assumed to be 23dBm+23dBm. Therefore, MSD value of PC2 case will be 6dB higher than that of PC3 case. New MSD value is shown in Table 5.20.3-1 below.

For MSD due to 4th order IMD generated by dual uplink of band 1 and band n77, the MSD value can be seen as dB related to 3rd order proportional of band 1 UL power + 1st order proportional of band n77 UL power. PC3 DC is assumed to be 20dBm+20dBm and PC2 DC is assumed to be 23dBm+23dBm. Therefore, MSD value of PC2 case will be 12dB higher than that of PC3 case. New MSD value is shown in Table 5.20.3-1 below.

For MSD due to 2nd order IMD generated by dual uplink of band 3 and band n77, the MSD value can be seen as dB related to 1st order proportional of band 3 UL power + 1st order proportional of band n77 UL power. PC3 DC is assumed to be 20dBm+20dBm and PC2 DC is assumed to be 23dBm+23dBm. Therefore, MSD value of PC2 case will be 6dB higher than that of PC3 case. New MSD value is shown in Table 5.20.3-1 below.

Table 5.20.3-1: MSD test points for Scell due to dual uplink operation for EN-DC in NR FR1 (three bands)

| NR or E-UTRA Band / Channel bandwidth / NRB / MSD | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- |
| EN-DC Configuration | EUTRA / NR band | UL Fc  (MHz) | UL/DL BW  (MHz) | UL  LCRB | DL Fc (MHz) | MSD  (dB) | IMD order |
| DC\_1A-3A\_n77A | 1 | 1950 | 5 | 25 | 2140 | N/A | N/A |
|  | 3 | 1712.5 | 5 | 25 | 1807.5 | 37.5 | IMD21 |
|  | n77 | 3757.5 | 10 | 50 | 3757.5 | N/A | N/A |
|  | 1 | 1950 | 5 | 25 | 2140 | N/A | N/A |
|  | 3 | 1775 | 5 | 25 | 1870 | 20.5 | IMD41 |
|  | n77 | 3980 | 10 | 50 | 3980 | N/A | N/A |
|  | 1 | 1950 | 5 | 25 | 2140 | 37.0 | IMD21 |
|  | 3 | 1775 | 5 | 25 | 1870 | N/A | N/A |
|  | n77 | 3915 | 10 | 50 | 3915 | N/A | N/A |
| NOTE 1: This band is subject to IMD5 also which MSD is not specified. | | | | | | | |

#### 5.20.4 ∆TIB and ∆RIB values

There is no change by comparing to the values for PC3 DC, so this section is omitted.

5.21 DC\_1\_n41

5.21.1 Configuration for DC

When requested EN-DC configuration is 2DL2UL, it is not needed to update the inter-band EN-DC configuration table. By referring to the maximum output power table, it can be checked whether these configurations support PC2. This band combination for PC3 is already specified in TS 38.101-3, so this section is omitted.

5.21.2 Maximum output power for DC

**Table 5.21.2-1:** **Maximum output power for inter-band EN-DC (two bands)**

| **EN-DC configuration** | **Power class 2**  **(dBm)** | **Tolerance**  **(dB)** | **Power class 3**  **(dBm)** | **Tolerance**  **(dB)** |
| --- | --- | --- | --- | --- |
| DC\_1A\_n41A | 266 | +2/-3 | 23 | +2/-3 |
| NOTE 6: The UE supports PC3 within E-UTRA cell group, and supports either PC3 or PC2 within NR cell group. Power class support within each individual cell group is signaled separately by the UE. | | | | |

5.21.3 REFSENS requirements for DC

Analysis of REFSENS exceptions or MSD requirements is needed due to higher power UL DC.

* The 2nd, 3rd, 4th, and 5th order harmonic do not fall into Rx frequencies of n41.
* The 2nd, 3rd, 4th, and 5th order harmonic mixing do not fall into Rx frequencies of band 1.
* The 2nd, 3rd, 4th, and 5th order IMD do not fall into Rx frequencies of band 1 and n41.
* Cross band isolation existing, the interference from band1 UL falls into n41 DL, and the interference from n41 UL also falls into band 1 DL.

The new MSD values are defined in below table.

**Table 5.21.3-1: Reference sensitivity exceptions (MSD) due to cross band isolation for PC2 EN-DC in NR FR1**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **E-UTRA or 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)** |
| 1 | n41 |  | 8.5 | 8.5 | 8.5 |  | 8.5 | 8.5 | 8.5 | 8.5 | 8.5 | 8.5 | 8.5 | 8.5 |
| n41 | 1 | 11.8 | 11.8 | 11.8 | 11.8 |  |  |  |  |  |  |  |  |  |

**Table 5.21.3-2: Uplink configuration for reference sensitivity exceptions due to cross band isolation for EN-DC in NR FR1**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **E-UTRA or NR Band / SCS / Channel bandwidth of the affected DL band / UL RB allocation of the agressor band** | | | | | | | | | | | | | | | |
| **UL band** | **DL band** | **SCS of UL band (kHz)** | **5 MHz**  **(LCRB)** | **10 MHz**  **(LCRB)** | **15 MHz**  **(LCRB)** | **20 MHz**  **(LCRB)** | **25 MHz**  **(LCRB)** | **30 MHz**  **(LCRB)** | **40 MHz**  **(LCRB)** | **50 MHz**  **(LCRB)** | **60 MHz**  **(LCRB)** | **70 MHz**  **(LCRB)** | **80 MHz**  **(LCRB)** | **90 MHz**  **(LCRB)** | **100 MHz**  **(LCRB)** |
| 1 | n41 | 15 |  | 100 | 100 | 100 |  | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| n41 | 1 | 30 | 128 | 128 | 128 | 128 |  |  |  |  |  |  |  |  |  |

5.21.4 ∆TIB and ∆RIB values

There is no change by comparing to the values for PC3 DC, so there is no additional values.

5.22 DC\_41\_n77

5.22.1 Configuration for DC

When requested EN-DC configuration is 2DL2UL, it is not needed to update the inter-band EN-DC configuration table. By referring to the maximum output power table, it can be checked whether these configurations support PC2. This band combination for PC3 is already specified in TS 38.101-3, so this section is omitted.

5.22.2 Maximum output power for DC

**Table 5.22.2-1:** **Maximum output power for inter-band EN-DC (two bands)**

| **EN-DC configuration** | **Power class 2**  **(dBm)** | **Tolerance**  **(dB)** | **Power class 3**  **(dBm)** | **Tolerance**  **(dB)** |
| --- | --- | --- | --- | --- |
| DC\_41A\_n77A | 266 | +2/-3 | 23 | +2/-3 |
| NOTE 6: The UE supports PC3 within E-UTRA cell group, and supports either PC3 or PC2 within NR cell group. Power class support within each individual cell group is signaled separately by the UE. | | | | |

5.22.3 REFSENS requirements for DC

Analysis of REFSENS exceptions or MSD requirements is needed due to higher power UL DC.

* The 2nd, 3rd, 4th, and 5th order harmonic do not fall into Rx frequencies of n77.
* The UL2/DL3 harmonic mixing falls into Rx frequencies of band 41.
* The UL3/DL2 harmonic mixing falls into RX frequencies of band n77
* The 2nd, 3rd, 4th, and 5th order IMD do not fall into Rx frequencies of band 41 and n77.
* Cross band isolation existing, the interference from band41 UL falls into n77 DL, and the interference from n77 UL also falls into band 41 DL.

New MSDs are defined in the following tables.

**Table 5.22.3-1:** **Reference sensitivity exceptions (MSD) due to receiver harmonic mixing for PC2 EN-DC in NR FR1**

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| E-UTRA or 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) | 40 MHz  (dB) | 50 MHz  (dB) | 60 MHz  (dB) | 80 MHz  (dB) | 90 MHz  (dB) | 100 MHz  (dB) |
| n77 | 41X | 19.4 | 19.4 | 19.4 | 19.4 |  |  |  |  |  |  |  |
| 41 | n77 |  | 17.0 | 17.0 | 17.0 | 17.0 | 17.0 | 17.0 | 17.0 | 17.0 | 17.0 | 17.0 |
| NOTE X: The requirements should be verified for DL EARFCN of the victim (lower) band (superscript LB) such that with the DL carrier frequency in the lower band and the UL carrier frequency in the higher band, both in MHz. | | | | | | | | | | | | |

**Table 5.22.3-2:** **Uplink configuration for reference sensitivity exceptions due to receiver harmonic mixing for EN-DC in NR FR1**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| E-UTRA or NR Band / SCS / Channel bandwidth of the affected DL band / UL RB allocation of the agressor band | | | | | | | | | | | | | |
| UL band | DL band | SCS of UL band  (kHz) | 5 MHz  (LCRB) | 10 MHz  (LCRB) | 15 MHz  (LCRB) | 20 MHz  (LCRB) | 25 MHz  (LCRB) | 40 MHz  (LCRB) | 50 MHz  (LCRB) | 60 MHz  (LCRB) | 80 MHz  (LCRB) | 90 MHz  (LCRB) | 100 MHz  (LCRB) |
| n77 | 41 | 15 | 12 | 25 | 36 | 50 |  |  |  |  |  |  |  |
| 41 | n77 | 15 |  | 50 | 75 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |

Table 5.22.3-3: Reference sensitivity exceptions (MSD) due to cross band isolation for PC2 EN-DC in NR FR1

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **E-UTRA or 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)** |
| 41 | n77 | 6.7 | 6.7 | 6.7 | 6.7 |  |  |  |  |  |  |  |  |  |
| n77 | 41X |  | 11 | 11 | 11 | 9.9 | 9.0 | 8.8 | 7.6 | 6.7 | 6.4 | 6.0 | 5.9 | 5.8 |
| NOTE X: Applicable only when harmonic mixing MSD for this combination is not applied. | | | | | | | | | | | | | | |

Table 5.22.3-4: Uplink configuration for reference sensitivity exceptions due to cross band isolation for EN-DC in NR FR1

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **E-UTRA or NR Band / SCS / Channel bandwidth of the affected DL band / UL RB allocation of the agressor band** | | | | | | | | | | | | | | | |
| **UL band** | **DL band** | **SCS of UL band (kHz)** | **5 MHz**  **(LCRB)** | **10 MHz**  **(LCRB)** | **15 MHz**  **(LCRB)** | **20 MHz**  **(LCRB)** | **25 MHz**  **(LCRB)** | **30 MHz**  **(LCRB)** | **40 MHz**  **(LCRB)** | **50 MHz**  **(LCRB)** | **60 MHz**  **(LCRB)** | **70 MHz**  **(LCRB)** | **80 MHz**  **(LCRB)** | **90 MHz**  **(LCRB)** | **100 MHz**  **(LCRB)** |
| 41 | n77 | 15 |  | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| n77 | 41 | 30 | 270 | 270 | 270 | 270 |  |  |  |  |  |  |  |  |  |

5.22.4 ∆TIB and ∆RIB values

There is no change by comparing to the values for PC3 DC, so this section is omitted.

### 5.23 DC\_1-3\_n78

#### 5.23.1 Configuration for DC

Table 5.23.1-1: Inter-band EN-DC configurations within FR1 (three bands)

| **EN-DC**  **configuration** | **Uplink EN-DC**  **configuration**  **(NOTE 1)** |
| --- | --- |
| DC\_1A-3A\_n78A5,14 | DC\_1A\_n78A14  DC\_3A\_n78A14 |
| DC\_1A-3A\_n78(2A)5,14 | DC\_1A\_n78A14  DC\_3A\_n78A14 |
| NOTE 1: Uplink EN-DC configurations are the configurations supported by the present release of specifications.  NOTE 5: Applicable for UE supporting inter-band EN-DC with mandatory simultaneous Rx/Tx capability  NOTE 14: PC3 or PC2 Uplink EN-DC configuration is applicable to EN-DC configurations. | |

#### 5.23.2 Maximum output power for DC

Based on studies of PC2 DC\_1\_n78 and PC2 DC\_3\_n78, this section can be omitted.

#### 5.23.3 REFSENS requirements for DC

Analysis of REFSENS exceptions or MSD requirements is needed due to higher power UL DC. Based on co-existence studies of DC\_1\_n78 and DC\_3\_n78 captured in TR 37.863-01-01 [3], own Rx impacts of the 3rd band are as follows:

* the 2nd and 5th order IMD generated by dual uplink of band 1 and band n78 may impact the Rx frequencies of band 3.
* the 5th order IMD generated by dual uplink of band 3 and band n78 may impact the Rx frequencies of band 1.

For MSD due to 2nd order IMD generated by dual uplink of band 1 and band n78, the MSD value can be seen as dB related to 1st order proportional of band 1 UL power + 1st order proportional of band n78 UL power. PC3 DC is assumed to be 20dBm + 20dBm and PC2 DC is assumed to be 23dBm + 23dBm. Therefore, MSD value of PC2 case will be 6dB higher than that of PC3 case. New MSD value is shown in Table 5.23.3-1 below.

For MSD due to 5th order IMD generated by dual uplink of band 3 and band n78, the MSD value can be seen as dB related to 3rd order proportional of band 3 UL power + 2nd order proportional of band n78 UL power. PC3 DC is assumed to be 20dBm + 20dBm and PC2 DC is assumed to be 23dBm + 23dBm. Therefore, MSD value of PC2 case will be 15dB higher than that of PC3 case. New MSD value is shown in Table 5.23.3-1 below.

Table 5.23.3-1: MSD test points for SCell due to dual uplink operation for PC2 EN-DC in NR FR1 (three bands)

| NR or E-UTRA Band / Channel bandwidth / NRB / MSD | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- |
| EN-DC Configuration | EUTRA / NR band | UL Fc  (MHz) | UL/DL BW  (MHz) | UL  LCRB | DL Fc (MHz) | MSD  (dB) | IMD order |
| DC\_1A-3A\_n78A  DC\_1A-3A\_n78(2A) | 1 | 1950 | 5 | 25 | 2140 | N/A | N/A |
|  | 3 | 1712.5 | 5 | 25 | 1807.5 | 37.2 | IMD21 |
|  | n78 | 3757.5 | 10 | 50 | 3757.5 | N/A | N/A |
|  | 1 | 1935 | 5 | 25 | 2125 | 17.8 | IMD5 |
|  | 3 | 1775 | 5 | 25 | 1870 | N/A | N/A |
|  | n78 | 3725 | 10 | 50 | 3725 | N/A | N/A |
| NOTE 1: This band is subject to IMD5 also which MSD is not specified. | | | | | | | |

#### 5.23.4 ∆TIB and ∆RIB values

There is no change by comparing to the values for PC3 DC, so this section is omitted.

### 5.24 DC\_1-42\_n78

#### 5.24.1 Configuration for DC

Table 5.24.1-1: Inter-band EN-DC configurations within FR1 (three bands)

| **EN-DC**  **configuration** | **Uplink EN-DC**  **configuration**  **(NOTE 1)** |
| --- | --- |
| DC\_1A-42A\_n78A14,15,16  DC\_1A-42C\_n78A14,15,16  DC\_1A-42D\_n78A14,15,16  DC\_1A-42E\_n78A14,15,16 | DC\_1A\_n78A14 |
| NOTE 1: Uplink EN-DC configurations are the configurations supported by the present release of specifications.  NOTE 14: PC3 or PC2 Uplink EN-DC configuration is applicable to EN-DC configurations.  NOTE 15: For UEs not indicating *interBandMRDC-WithOverlapDL-Bands-r16*, the minimum requirements for intra-band non-contiguous EN-DC apply for the Band 42/48 and Band n77/n78 combination and for the Band 2 and Band n25 combinations. For UEs not indicating *interBandMRDC-WithOverlapDL-Bands-r16*, when UE capability *interBandContiguousMRDC* is indicated, the minimum requirements for intra-band-contiguous EN-DC also should be met in addtion to intra-band non-contiguous EN-DC*.*  NOTE 16: For UEs not indicating *interBandMRDC-WithOverlapDL-Bands-r16*, the minimum requirements for inter-band EN-DC apply when the maximum power spectral density imbalance between downlink carriers contained in overlapping or partially overlapping DL bands is within 6 dB. | |

#### 5.24.2 Maximum output power for DC

Based on studies of PC2 DC\_1\_n78, this section can be omitted.

#### 5.24.3 REFSENS requirements for DC

Analysis of REFSENS exceptions or MSD requirements is needed due to higher power UL DC. Based on co-existence studies of DC\_1\_n78 captured in TR 37.863-01-01 [3], own Rx impacts of the 3rd band are as follows:

* the 4th order IMD generated by dual uplink of band 1 and band n78 may impact the Rx frequencies of band 42.

However, IMD will not be an issue because there is non-simultaneous Rx/Tx operation between band 42 and band n78. Therefore, there is no MSD issue for this DC configuration.

#### 5.24.4 ∆TIB and ∆RIB values

There is no change by comparing to the values for PC3 DC, so this section is omitted.

### 5.25 DC\_3-42\_n78

#### 5.25.1 Configuration for DC

Table 5.25.1-1: Inter-band EN-DC configurations within FR1 (three bands)

| **EN-DC**  **configuration** | **Uplink EN-DC**  **configuration**  **(NOTE 1)** |
| --- | --- |
| DC\_3A-42A\_n78A14,15,16  DC\_3A-42C\_n78A14,15,16  DC\_3A-42D\_n78A14,15,16  DC\_3A-42E\_n78A14,15,16 | DC\_3A\_n78A14 |
| NOTE 1: Uplink EN-DC configurations are the configurations supported by the present release of specifications.  NOTE 14: PC3 or PC2 Uplink EN-DC configuration is applicable to EN-DC configurations.  NOTE 15: For UEs not indicating *interBandMRDC-WithOverlapDL-Bands-r16*, the minimum requirements for intra-band non-contiguous EN-DC apply for the Band 42/48 and Band n77/n78 combination and for the Band 2 and Band n25 combinations. For UEs not indicating *interBandMRDC-WithOverlapDL-Bands-r16*, when UE capability *interBandContiguousMRDC* is indicated, the minimum requirements for intra-band-contiguous EN-DC also should be met in addtion to intra-band non-contiguous EN-DC*.*  NOTE 16: For UEs not indicating *interBandMRDC-WithOverlapDL-Bands-r16*, the minimum requirements for inter-band EN-DC apply when the maximum power spectral density imbalance between downlink carriers contained in overlapping or partially overlapping DL bands is within 6 dB. | |

#### 5.25.2 Maximum output power for DC

Based on studies of PC2 DC\_3\_n78, this section can be omitted.

#### 5.25.3 REFSENS requirements for DC

Analysis of REFSENS exceptions or MSD requirements is needed due to higher power UL DC. Based on co-existence studies of DC\_3\_n78 captured in TR 37.863-01-01 [3], own Rx impacts of the 3rd band are as follows:

* the 4th and 5th order IMD generated by dual uplink of band 3 and band n78 may impact the Rx frequencies of band 42.

However, IMD will not be an issue because there is non-simultaneous Rx/Tx operation between band 42 and band n78. Therefore, there is no MSD issue for this DC configuration.

#### 5.25.4 ∆TIB and ∆RIB values

There is no change by comparing to the values for PC3 DC, so this section is omitted.

### 5.26 DC\_21-42\_n78

#### 5.26.1 Configuration for DC

Table 5.26.1-1: Inter-band EN-DC configurations within FR1 (three bands)

| **EN-DC**  **configuration** | **Uplink EN-DC**  **configuration**  **(NOTE 1)** |
| --- | --- |
| DC\_21A-42A\_n78A14,15,16  DC\_21A-42C\_n78A14,15,16 | DC\_21A\_n78A14 |
| NOTE 1: Uplink EN-DC configurations are the configurations supported by the present release of specifications.  NOTE 14: PC3 or PC2 Uplink EN-DC configuration is applicable to EN-DC configurations.  NOTE 15: For UEs not indicating *interBandMRDC-WithOverlapDL-Bands-r16*, the minimum requirements for intra-band non-contiguous EN-DC apply for the Band 42/48 and Band n77/n78 combination and for the Band 2 and Band n25 combinations. For UEs not indicating *interBandMRDC-WithOverlapDL-Bands-r16*, when UE capability *interBandContiguousMRDC* is indicated, the minimum requirements for intra-band-contiguous EN-DC also should be met in addtion to intra-band non-contiguous EN-DC*.*  NOTE 16: For UEs not indicating *interBandMRDC-WithOverlapDL-Bands-r16*, the minimum requirements for inter-band EN-DC apply when the maximum power spectral density imbalance between downlink carriers contained in overlapping or partially overlapping DL bands is within 6 dB. | |

#### 5.26.2 Maximum output power for DC

Based on studies of PC2 DC\_21\_n78, this section can be omitted.

#### 5.26.3 REFSENS requirements for DC

Analysis of REFSENS exceptions or MSD requirements is needed due to higher power UL DC. Based on co-existence studies of DC\_21\_n78 captured in TR 37.863-01-01 [3], own Rx impacts of the 3rd band are as follows:

* the IMDs up to 5th order generated by dual uplink of band 21 and band n78 do not impact the Rx frequencies of band 42.

Therefore, there is no MSD issue for this DC configuration.

#### 5.26.4 ∆TIB and ∆RIB values

There is no change by comparing to the values for PC3 DC, so this section is omitted.

### 5.27 DC\_1-3\_n79

#### 5.27.1 Configuration for DC

Table 5.27.1-1: Inter-band EN-DC configurations within FR1 (three bands)

| **EN-DC**  **configuration** | **Uplink EN-DC**  **configuration**  **(NOTE 1)** |
| --- | --- |
| DC\_1A-3A\_n79A5,14 | DC\_1A\_n79A14  DC\_3A\_n79A14 |
| NOTE 1: Uplink EN-DC configurations are the configurations supported by the present release of specifications.  NOTE 5: Applicable for UE supporting inter-band EN-DC with mandatory simultaneous Rx/Tx capability  NOTE 14: PC3 or PC2 Uplink EN-DC configuration is applicable to EN-DC configurations. | |

#### 5.27.2 Maximum output power for DC

Based on studies of PC2 DC\_1\_n79 and PC2 DC\_3\_n79, this section can be omitted.

#### 5.27.3 REFSENS requirements for DC

Analysis of REFSENS exceptions or MSD requirements is needed due to higher power UL DC. Based on co-existence studies of DC\_1\_n79 and DC\_3\_n79 captured in TR 37.863-01-01 [3], own Rx impacts of the 3rd band are as follows:

* the IMDs up to 5th order generated by dual uplink of band 1 and band n79 do not impact the Rx frequencies of band 3.
* the 5th order IMD generated by dual uplink of band 3 and band n79 may impact the Rx frequencies of band 1.

For MSD due to 5th order IMD generated by dual uplink of band 3 and band n79, the MSD value can be seen as dB related to 4th order proportional of band 3 UL power + 1st order proportional of band n79 UL power. PC3 DC is assumed to be 20dBm + 20dBm and PC2 DC is assumed to be 23dBm + 23dBm. In addition, PSD will be 6dB higher when UL CBW of n79 is changed from 40MHz to 10MHz. Therefore, MSD value of PC2 case will be 21dB higher than that of PC3 case. New MSD value is shown in Table 5.27.3-1 below.

Table 5.27.3-1: MSD test points for SCell due to dual uplink operation for PC2 EN-DC in NR FR1 (three bands)

| NR or E-UTRA Band / Channel bandwidth / NRB / MSD | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- |
| EN-DC Configuration | EUTRA / NR band | UL Fc  (MHz) | UL/DL BW  (MHz) | UL  LCRB | DL Fc (MHz) | MSD  (dB) | IMD order |
| DC\_1A-3A\_n79A | 1 | 1950 | 5 | 25 | 2140 | 24.6 | IMD5 |
|  | 3 | 1750 | 5 | 25 | 1845 | N/A | N/A |
|  | n79 | 4860 | 10 | 50 | 4860 | N/A | N/A |

#### 5.27.4 ∆TIB and ∆RIB values

There is no change by comparing to the values for PC3 DC, so this section is omitted.

### 5.28 DC\_1-19\_n79

#### 5.28.1 Configuration for DC

Table 5.28.1-1: Inter-band EN-DC configurations within FR1 (three bands)

| **EN-DC**  **configuration** | **Uplink EN-DC**  **configuration**  **(NOTE 1)** |
| --- | --- |
| DC\_1A-19A\_n79A5,14 | DC\_1A\_n79A14  DC\_19A\_n79A14 |
| NOTE 1: Uplink EN-DC configurations are the configurations supported by the present release of specifications.  NOTE 5: Applicable for UE supporting inter-band EN-DC with mandatory simultaneous Rx/Tx capability  NOTE 14: PC3 or PC2 Uplink EN-DC configuration is applicable to EN-DC configurations. | |

#### 5.28.2 Maximum output power for DC

Based on studies of PC2 DC\_1\_n79 and PC2 DC\_19\_n79, this section can be omitted.

#### 5.28.3 REFSENS requirements for DC

Analysis of REFSENS exceptions or MSD requirements is needed due to higher power UL DC. Based on co-existence studies of DC\_1\_n79 and DC\_19\_n79 captured in TR 37.863-01-01 [3], own Rx impacts of the 3rd band are as follows:

* the 3rd and 4th order IMD generated by dual uplink of band 1 and band n79 may impact the Rx frequencies of band 19.
* the 4th order IMD generated by dual uplink of band 19 and band n79 may impact the Rx frequencies of band 1.

For MSD due to 3rd order IMD generated by dual uplink of band 1 and band n79, the MSD value can be seen as dB related to 2nd order proportional of band 1 UL power + 1st order proportional of band n79 UL power. PC3 DC is assumed to be 20dBm + 20dBm and PC2 DC is assumed to be 23dBm + 23dBm. In addition, PSD will be 6dB higher when UL CBW of n79 is changed from 40MHz to 10MHz. Therefore, MSD value of PC2 case will be 15dB higher than that of PC3 case. New MSD value is shown in Table 5.28.3-1 below.

For MSD due to 4th order IMD generated by dual uplink of band 19 and band n79, the MSD value can be seen as dB related to 3rd order proportional of band 19 UL power + 1st order proportional of band n79 UL power. PC3 DC is assumed to be 20dBm + 20dBm and PC2 DC is assumed to be 23dBm + 23dBm. In addition, PSD will be 6dB higher when UL CBW of n79 is changed from 40MHz to 10MHz. Therefore, MSD value of PC2 case will be 18dB higher than that of PC3 case. New MSD value is shown in Table 5.28.3-1 below.

Table 5.28.3-1: MSD test points for SCell due to dual uplink operation for PC2 EN-DC in NR FR1 (three bands)

| NR or E-UTRA Band / Channel bandwidth / NRB / MSD | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- |
| EN-DC Configuration | EUTRA / NR band | UL Fc  (MHz) | UL/DL BW  (MHz) | UL  LCRB | DL Fc (MHz) | MSD  (dB) | IMD order |
| DC\_1A-19A\_n79A | 1 | 1950 | 5 | 25 | 2140 | N/A | N/A |
|  | 19 | 837.5 | 5 | 25 | 882.5 | 33.3 | IMD35 |
|  | n79 | 4782.5 | 10 | 50 | 4782.5 | N/A | N/A |
|  | 1 | 1950 | 5 | 25 | 2140 | 26.1 | IMD4 |
|  | 19 | 837.5 | 5 | 25 | 882.5 | N/A | N/A |
|  | n79 | 4652.5 | 10 | 50 | 4652.5 | N/A | N/A |
| NOTE 5: This band is subject to IMD4 also which MSD is not specified. | | | | | | | |

#### 5.28.4 ∆TIB and ∆RIB values

There is no change by comparing to the values for PC3 DC, so this section is omitted.

### 5.29 DC\_1-21\_n79

#### 5.29.1 Configuration for DC

Table 5.29.1-1: Inter-band EN-DC configurations within FR1 (three bands)

| **EN-DC**  **configuration** | **Uplink EN-DC**  **configuration**  **(NOTE 1)** |
| --- | --- |
| DC\_1A-21A\_n79A5,14 | DC\_1A\_n79A14  DC\_21A\_n79A14 |
| NOTE 1: Uplink EN-DC configurations are the configurations supported by the present release of specifications.  NOTE 5: Applicable for UE supporting inter-band EN-DC with mandatory simultaneous Rx/Tx capability  NOTE 14: PC3 or PC2 Uplink EN-DC configuration is applicable to EN-DC configurations. | |

#### 5.29.2 Maximum output power for DC

Based on studies of PC2 DC\_1\_n79 and PC2 DC\_21\_n79, this section can be omitted.

#### 5.29.3 REFSENS requirements for DC

Analysis of REFSENS exceptions or MSD requirements is needed due to higher power UL DC. Based on co-existence studies of DC\_1\_n79 and DC\_21\_n79 captured in TR 37.863-01-01 [3], own Rx impacts of the 3rd band are as follows:

* the 4th order IMD generated by dual uplink of band 1 and band n79 may impact the Rx frequencies of band 21.
* the IMDs up to 5th order generated by dual uplink of band 21 and band n79 do not impact the Rx frequencies of band 1.

Considering that Band 21 is currently operated only by a certain operator in Japan, the frequency range can be limited as Band 1 UL/DL = 1940-1960/2130-2150MHz and Band n79 UL/DL = 4400-4900/4400-4900MHz. This is based on the discussion when PC3 DC with the same configuration was specified [4]. Therefore, own Rx impacts can be simplified as below:

* the IMDs up to 5th order generated by dual uplink of band 1 and band n79 do not impact the Rx frequencies of band 21.
* the IMDs up to 5th order generated by dual uplink of band 21 and band n79 do not impact the Rx frequencies of band 1.

Based on the above, new MSD value is shown in Table 5.29.3-1 below.

Table 5.29.3-1: MSD test points for SCell due to dual uplink operation for PC2 EN-DC in NR FR1 (three bands)

| NR or E-UTRA Band / Channel bandwidth / NRB / MSD | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- |
| EN-DC Configuration | EUTRA / NR band | UL Fc  (MHz) | UL/DL BW  (MHz) | UL  LCRB | DL Fc (MHz) | MSD  (dB) | IMD order |
| DC\_1A-21A\_n79AX1,X2 | 1 | N/A | N/A | N/A | N/A | N/A | N/A |
|  | 21 | N/A | N/A | N/A | N/A | N/A | IMD4 |
|  | n79 | N/A | N/A | N/A | N/A | N/A | N/A |
| NOTE X1: The frequency range in band n79 is restricted for this band combination to 4400 - 4900 MHz for both the UL and the DL.  NOTE X2: The frequency range in band 1 is restricted for this band combination to 1940 - 1960 MHz for the UL and 2130 - 2150 MHz for the DL. | | | | | | | |

#### 5.29.4 ∆TIB and ∆RIB values

There is no change by comparing to the values for PC3 DC, so this section is omitted.

### 5.30 DC\_1-42\_n79

#### 5.30.1 Configuration for DC

Table 5.30.1-1: Inter-band EN-DC configurations within FR1 (three bands)

| **EN-DC**  **configuration** | **Uplink EN-DC**  **configuration**  **(NOTE 1)** |
| --- | --- |
| DC\_1A-42A\_n79A14  DC\_1A-42C\_n79A14  DC\_1A-42D\_n79A14  DC\_1A-42E\_n79A14 | DC\_1A\_n79A14 |
| NOTE 1: Uplink EN-DC configurations are the configurations supported by the present release of specifications.  NOTE 14: PC3 or PC2 Uplink EN-DC configuration is applicable to EN-DC configurations. | |

#### 5.30.2 Maximum output power for DC

Based on studies of PC2 DC\_1\_n79, this section can be omitted.

#### 5.30.3 REFSENS requirements for DC

Analysis of REFSENS exceptions or MSD requirements is needed due to higher power UL DC. Based on co-existence studies of DC\_1\_n79 captured in TR 37.863-01-01 [3], own Rx impacts of the 3rd band are as follows:

* the 5th order IMD generated by dual uplink of band 1 and band n79 may impact the Rx frequencies of band 42.

For MSD due to 5th order IMD generated by dual uplink of band 3 and band n79, the MSD value can be seen as dB related to 4th order proportional of band 1 UL power + 1st order proportional of band n79 UL power. PC3 DC is assumed to be 20dBm + 20dBm and PC2 DC is assumed to be 23dBm + 23dBm. In addition, PSD will be 6dB higher when UL CBW of n79 is changed from 40MHz to 10MHz. Therefore, MSD value of PC2 case will be 21dB higher than that of PC3 case. New MSD value is shown in Table 5.30.3-1 below.

Table 5.30.3-1: MSD test points for SCell due to dual uplink operation for PC2 EN-DC in NR FR1 (three bands)

| NR or E-UTRA Band / Channel bandwidth / NRB / MSD | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- |
| EN-DC Configuration | EUTRA / NR band | UL Fc  (MHz) | UL/DL BW  (MHz) | UL  LCRB | DL Fc (MHz) | MSD  (dB) | IMD order |
| DC\_1A-42A\_n79A  DC\_1A-42C\_n79A  DC\_1A-42D\_n79A  DC\_1A-42E\_n79A | 1 | 1977.5 | 5 | 25 | 2167.5 | N/A | N/A |
|  | 42 | 3490 | 5 | 25 | 3490 | 25.8 | IMD5 |
|  | n79 | 4420 | 10 | 50 | 4420 | N/A | N/A |

#### 5.30.4 ∆TIB and ∆RIB values

There is no change by comparing to the values for PC3 DC, so this section is omitted.

### 5.31 DC\_3-19\_n79

#### 5.31.1 Configuration for DC

Table 5.31.1-1: Inter-band EN-DC configurations within FR1 (three bands)

| **EN-DC**  **configuration** | **Uplink EN-DC**  **configuration**  **(NOTE 1)** |
| --- | --- |
| DC\_3A-19A\_n79A5,14 | DC\_3A\_n79A14  DC\_19A\_n79A14 |
| NOTE 1: Uplink EN-DC configurations are the configurations supported by the present release of specifications.  NOTE 5: Applicable for UE supporting inter-band EN-DC with mandatory simultaneous Rx/Tx capability  NOTE 14: PC3 or PC2 Uplink EN-DC configuration is applicable to EN-DC configurations. | |

#### 5.31.2 Maximum output power for DC

Based on studies of PC2 DC\_3\_n79 and PC2 DC\_19\_n79, this section can be omitted.

#### 5.31.3 REFSENS requirements for DC

Analysis of REFSENS exceptions or MSD requirements is needed due to higher power UL DC. Based on co-existence studies of DC\_3\_n79 and DC\_19\_n79 captured in TR 37.863-01-01 [3], own Rx impacts of the 3rd band are follows:

* the 3rd and 4th order IMD generated by dual uplink of band 3 and band n79 may impact the Rx frequencies of band 19.
* the 4th order IMD generated by dual uplink of band 19 and band n79 may impact the Rx frequencies of band 3.

For MSD due to 3rd order IMD generated by dual uplink of band 3 and band n79, the MSD value can be seen as dB related to 2nd order proportional of band 3 UL power + 1st order proportional of band n79 UL power. PC3 DC is assumed to be 20dBm + 20dBm and PC2 DC is assumed to be 23dBm + 23dBm. In addition, PSD will be 6dB higher when UL CBW of n79 is changed from 40MHz to 10MHz. Therefore, MSD value of PC2 case will be 15dB higher than that of PC3 case. New MSD value is shown in Table 5.31.3-1 below.

For MSD due to 4th order IMD generated by dual uplink of band 19 and band n79, the MSD value can be seen as dB related to 3rd order proportional of band 19 UL power + 1st order proportional of band n79 UL power. PC3 DC is assumed to be 20dBm + 20dBm and PC2 DC is assumed to be 23dBm + 23dBm. In addition, PSD will be 6dB higher when UL CBW of n79 is changed from 40MHz to 10MHz. Therefore, MSD value of PC2 case will be 18dB higher than that of PC3 case. New MSD value is shown in Table 5.31.3-1 below.

Table 5.31.3-1: MSD test points for SCell due to dual uplink operation for PC2 EN-DC in NR FR1 (three bands)

| NR or E-UTRA Band / Channel bandwidth / NRB / MSD | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- |
| EN-DC Configuration | EUTRA / NR band | UL Fc  (MHz) | UL/DL BW  (MHz) | UL  LCRB | DL Fc (MHz) | MSD  (dB) | IMD order |
| DC\_3A-19A\_n79A | 3 | 1775 | 5 | 25 | 1870 | N/A | N/A |
|  | 19 | 840 | 5 | 25 | 885 | 33.5 | IMD35 |
|  | n79 | 4435 | 10 | 50 | 4435 | N/A | N/A |
|  | 3 | 1782.5 | 5 | 25 | 1877.5 | 18.2 | IMD4 |
|  | 19 | 842.5 | 5 | 25 | 887.5 | N/A | N/A |
|  | n79 | 4420 | 10 | 50 | 4420 | N/A | N/A |
| NOTE 5: This band is subject to IMD4 also which MSD is not specified. | | | | | | | |

#### 5.31.4 ∆TIB and ∆RIB values

There is no change by comparing to the values for PC3 DC, so this section is omitted.

### 5.32 DC\_3-21\_n79

#### 5.32.1 Configuration for DC

Table 5.32.1-1: Inter-band EN-DC configurations within FR1 (three bands)

| **EN-DC**  **configuration** | **Uplink EN-DC**  **configuration**  **(NOTE 1)** |
| --- | --- |
| DC\_3A-21A\_n79A5,14 | DC\_3A\_n79A14  DC\_21A\_n79A14 |
| NOTE 1: Uplink EN-DC configurations are the configurations supported by the present release of specifications.  NOTE 5: Applicable for UE supporting inter-band EN-DC with mandatory simultaneous Rx/Tx capability  NOTE 14: PC3 or PC2 Uplink EN-DC configuration is applicable to EN-DC configurations. | |

#### 5.32.2 Maximum output power for DC

Based on studies of PC2 DC\_3\_n79 and PC2 DC\_21\_n79, this section can be omitted.

#### 5.32.3 REFSENS requirements for DC

Analysis of REFSENS exceptions or MSD requirements is needed due to higher power UL DC. Based on co-existence studies of DC\_3\_n79 and DC\_21\_n79 captured in TR 37.863-01-01 [3], own Rx impacts of the 3rd band are follows:

* the 3rd order IMD generated by dual uplink of band 3 and band n79 may impact the Rx frequencies of band 21.
* the 3rd order IMD generated by dual uplink of band 21 and band n79 may impact the Rx frequencies of band 3.

Considering that Band 21 is currently operated only by a certain operator in Japan, the frequency range can be limited as Band n79 UL/DL = 4400-4900/4400-4900MHz. This is based on the discussion when PC3 DC with the same configuration was specified [4]. Therefore, own Rx impacts can be simplified as below:

* the IMDs up to 5th order generated by dual uplink of band 3 and band n79 do not impact the Rx frequencies of band 21.
* the 3rd order IMD generated by dual uplink of band 21 and band n79 may impact the Rx frequencies of band 3.

For MSD due to 3rd order IMD generated by dual uplink of band 21 and band n79, the MSD value can be seen as dB related to 2nd order proportional of band 21 UL power + 1st order proportional of band n79 UL power. PC3 DC is assumed to be 20dBm + 20dBm and PC2 DC is assumed to be 23dBm + 23dBm. In addition, PSD will be 6dB higher when UL CBW of n79 is changed from 40MHz to 10MHz. Therefore, MSD value of PC2 case will be 15dB higher than that of PC3 case. New MSD value is shown in Table 5.32.3-1 below.

Table 5.32.3-1: MSD test points for SCell due to dual uplink operation for PC2 EN-DC in NR FR1 (three bands)

| NR or E-UTRA Band / Channel bandwidth / NRB / MSD | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- |
| EN-DC Configuration | EUTRA / NR band | UL Fc  (MHz) | UL/DL BW  (MHz) | UL  LCRB | DL Fc (MHz) | MSD  (dB) | IMD order |
| DC\_3A-21A\_n79AX | 3 | N/A | N/A | N/A | N/A | N/A | N/A |
|  | 21 | N/A | N/A | N/A | N/A | N/A | IMD3 |
|  | n79 | N/A | N/A | N/A | N/A | N/A | N/A |
|  | 3 | 1774.2 | 5 | 25 | 1869.2 | 32.8 | IMD3 |
|  | 21 | 1450.4 | 5 | 25 | 1498.4 | N/A | N/A |
|  | n79 | 4770 | 10 | 50 | 4770 | N/A | N/A |
| NOTE X: The frequency range in band n79 is restricted for this band combination to 4400 - 4900 MHz for both the UL and the DL. | | | | | | | |

#### 5.32.4 ∆TIB and ∆RIB values

There is no change by comparing to the values for PC3 DC, so this section is omitted.

### 5.33 DC\_3-42\_n79

#### 5.33.1 Configuration for DC

Table 5.33.1-1: Inter-band EN-DC configurations within FR1 (three bands)

| **EN-DC**  **configuration** | **Uplink EN-DC**  **configuration**  **(NOTE 1)** |
| --- | --- |
| DC\_3A-42A\_n79A14  DC\_3A-42C\_n79A14  DC\_3A-42D\_n79A14  DC\_3A-42E\_n79A14 | DC\_3A\_n79A14 |
| NOTE 1: Uplink EN-DC configurations are the configurations supported by the present release of specifications.  NOTE 14: PC3 or PC2 Uplink EN-DC configuration is applicable to EN-DC configurations. | |

#### 5.33.2 Maximum output power for DC

Based on studies of PC2 DC\_3\_n79, this section can be omitted.

#### 5.33.3 REFSENS requirements for DC

Analysis of REFSENS exceptions or MSD requirements is needed due to higher power UL DC. Based on co-existence studies of DC\_3\_n79 captured in TR 37.863-01-01 [3], own Rx impacts of the 3rd band are as follows:

* the 5th order IMD generated by dual uplink of band 3 and band n79 may impact the Rx frequencies of band 42.

Considering actual spectrum holdings, the frequency range can be limited as Band n79 UL/DL = 4500-5000/4500-5000MHz. This is based on the discussion when PC3 DC with the same configuration was specified [4]. Therefore, own Rx impacts can be simplified as below:

* the IMDs up to 5th order generated by dual uplink of band 3 and band n79 do not impact the Rx frequencies of band 42.

Therefore, MSD value is shown in Table 5.33.3-1 below.

Table 5.33.3-1: MSD test points for SCell due to dual uplink operation for PC2 EN-DC in NR FR1 (three bands)

| NR or E-UTRA Band / Channel bandwidth / NRB / MSD | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- |
| EN-DC Configuration | EUTRA / NR band | UL Fc  (MHz) | UL/DL BW  (MHz) | UL  LCRB | DL Fc (MHz) | MSD  (dB) | IMD order |
| DC\_3A-42A\_n79AX  DC\_3A-42C\_n79AX  DC\_3A-42D\_n79AX  DC\_3A-42E\_n79AX | 3 | N/A | N/A | N/A | N/A | N/A | N/A |
|  | 42 | N/A | N/A | N/A | N/A | N/A | IMD5 |
|  | n79 | N/A | N/A | N/A | N/A | N/A | N/A |
| NOTE X: The frequency range in band n79 is restricted for this band combination to 4500 - 5000 MHz for both the UL and the DL. | | | | | | | |

#### 5.33.4 ∆TIB and ∆RIB values

There is no change by comparing to the values for PC3 DC, so this section is omitted.

### 5.34 DC\_19-21\_n79

#### 5.34.1 Configuration for DC

Table 5.34.1-1: Inter-band EN-DC configurations within FR1 (three bands)

| **EN-DC**  **configuration** | **Uplink EN-DC**  **configuration**  **(NOTE 1)** |
| --- | --- |
| DC\_19A-21A\_n79A5,14 | DC\_19A\_n79A14  DC\_21A\_n79A14 |
| NOTE 1: Uplink EN-DC configurations are the configurations supported by the present release of specifications.  NOTE 5: Applicable for UE supporting inter-band EN-DC with mandatory simultaneous Rx/Tx capability  NOTE 14: PC3 or PC2 Uplink EN-DC configuration is applicable to EN-DC configurations. | |

#### 5.34.2 Maximum output power for DC

Based on studies of PC2 DC\_19\_n79 and PC2 DC\_21\_n79, this section can be omitted.

#### 5.34.3 REFSENS requirements for DC

Analysis of REFSENS exceptions or MSD requirements is needed due to higher power UL DC. Based on co-existence studies of DC\_19\_n79 and DC\_21\_n79 captured in TR 37.863-01-01 [3], own Rx impacts of the 3rd band are follows:

* the 5th order IMD generated by dual uplink of band 19 and band n79 may impact the Rx frequencies of band 21.
* the 5th order IMD generated by dual uplink of band 21 and band n79 may impact the Rx frequencies of band 19.

Considering that Band 21 is currently operated only by a certain operator in Japan, the frequency range can be limited as Band n79 UL/DL = 4400-4900/4400-4900MHz. This is based on the discussion when PC3 DC with the same configuration was specified [4]. Therefore, own Rx impacts can be simplified as below:

* the 5th order IMD generated by dual uplink of band 19 and band n79 may impact the Rx frequencies of band 21.
* the IMDs up to 5th order generated by dual uplink of band 21 and band n79 do not impact the Rx frequencies of band 19.

For MSD due to 5th order IMD generated by dual uplink of band 19 and band n79, the MSD value can be seen as dB related to 4th order proportional of band 19 UL power + 1st order proportional of band n79 UL power. PC3 DC is assumed to be 20dBm + 20dBm and PC2 DC is assumed to be 23dBm + 23dBm. In addition, PSD will be 6dB higher when UL CBW of n79 is changed from 40MHz to 10MHz. Therefore, MSD value of PC2 case will be 21dB higher than that of PC3 case. New MSD value is shown in Table 5.34.3-1 below.

Table 5.34.3-1: MSD test points for SCell due to dual uplink operation for PC2 EN-DC in NR FR1 (three bands)

| NR or E-UTRA Band / Channel bandwidth / NRB / MSD | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- |
| EN-DC Configuration | EUTRA / NR band | UL Fc  (MHz) | UL/DL BW  (MHz) | UL  LCRB | DL Fc (MHz) | MSD  (dB) | IMD order |
| DC\_19A-21A\_n79AX | 19 | N/A | N/A | N/A | N/A | N/A | IMD5 |
|  | 21 | N/A | N/A | N/A | N/A | N/A | N/A |
|  | n79 | N/A | N/A | N/A | N/A | N/A | N/A |
|  | 19 | 837.5 | 5 | 25 | 882.2 | N/A | N/A |
|  | 21 | 1452 | 5 | 25 | 1500 | 24.8 | IMD5 |
|  | n79 | 4850 | 10 | 50 | 4850 | N/A | N/A |
| NOTE X: The frequency range in band n79 is restricted for this band combination to 4400 - 4900 MHz for both the UL and the DL. | | | | | | | |

#### 5.34.4 ∆TIB and ∆RIB values

There is no change by comparing to the values for PC3 DC, so this section is omitted.

### 5.35 DC\_19-42\_n79

#### 5.35.1 Configuration for DC

Table 5.35.1-1: Inter-band EN-DC configurations within FR1 (three bands)

| **EN-DC**  **configuration** | **Uplink EN-DC**  **configuration**  **(NOTE 1)** |
| --- | --- |
| DC\_19A-42A\_n79A14  DC\_19A-42C\_n79A14 | DC\_19A\_n79A14 |
| NOTE 1: Uplink EN-DC configurations are the configurations supported by the present release of specifications.  NOTE 14: PC3 or PC2 Uplink EN-DC configuration is applicable to EN-DC configurations.. | |

#### 5.35.2 Maximum output power for DC

Based on studies of PC2 DC\_19\_n79, this section can be omitted.

#### 5.35.3 REFSENS requirements for DC

Analysis of REFSENS exceptions or MSD requirements is needed due to higher power UL DC. Based on co-existence studies of DC\_19\_n79 captured in TR 37.863-01-01 [3], own Rx impacts of the 3rd band are as follows:

* the 2nd order IMD generated by dual uplink of band 19 and band n79 may impact the Rx frequencies of band 42.

Considering that Band 19 is currently operated only by a certain operator in Japan, the frequency range can be limited as Band n79 UL/DL = 4500-4600/4500-4600MHz. This is based on the discussion when PC3 DC with the same configuration was specified [4]. Therefore, own Rx impacts can be simplified as below:

* the IMDs up to 5th order generated by dual uplink of band 19 and band n79 do not impact the Rx frequencies of band 42.

Therefore, MSD value is shown in Table 5.35.3-1 below.

Table 5.35.3-1: MSD test points for SCell due to dual uplink operation for PC2 EN-DC in NR FR1 (three bands)

| NR or E-UTRA Band / Channel bandwidth / NRB / MSD | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- |
| EN-DC Configuration | EUTRA / NR band | UL Fc  (MHz) | UL/DL BW  (MHz) | UL  LCRB | DL Fc (MHz) | MSD  (dB) | IMD order |
| DC\_19A-42A\_n79AX  DC\_19A-42C\_n79AX | 19 | N/A | N/A | N/A | N/A | N/A | N/A |
|  | 42 | N/A | N/A | N/A | N/A | N/A | IMD2 |
|  | n79 | N/A | N/A | N/A | N/A | N/A | N/A |
| NOTE X: The frequency range in band n79 is restricted for this band combination to 4500 - 4600 MHz for both the UL and the DL. | | | | | | | |

#### 5.35.4 ∆TIB and ∆RIB values

There is no change by comparing to the values for PC3 DC, so this section is omitted.

### 5.36 DC\_21-42\_n79

#### 5.36.1 Configuration for DC

Table 5.36.1-1: Inter-band EN-DC configurations within FR1 (three bands)

| **EN-DC**  **configuration** | **Uplink EN-DC**  **configuration**  **(NOTE 1)** |
| --- | --- |
| DC\_21A-42A\_n79A14  DC\_21A-42C\_n79A14 | DC\_21A\_n79A14 |
| NOTE 1: Uplink EN-DC configurations are the configurations supported by the present release of specifications.  NOTE 14: PC3 or PC2 Uplink EN-DC configuration is applicable to EN-DC configurations. | |

#### 5.36.2 Maximum output power for DC

Based on studies of PC2 DC\_21\_n79, this section can be omitted.

#### 5.36.3 REFSENS requirements for DC

Analysis of REFSENS exceptions or MSD requirements is needed due to higher power UL DC. Based on co-existence studies of DC\_21\_n79 captured in TR 37.863-01-01 [3], own Rx impacts of the 3rd band are as follows:

* the 2nd order IMD generated by dual uplink of band 21 and band n79 may impact the Rx frequencies of band 42.

Considering that Band 21 is currently operated only by a certain operator in Japan, the frequency range can be limited as Band n79 UL/DL = 4500-4600/4500-4600MHz. This is based on the discussion when PC3 DC with the same configuration was specified [4]. Therefore, own Rx impacts can be simplified as below:

* the IMDs up to 5th order generated by dual uplink of band 21 and band n79 do not impact the Rx frequencies of band 42.

Therefore, MSD value is shown in Table 5.36.3-1 below.

Table 5.36.3-1: MSD test points for SCell due to dual uplink operation for PC2 EN-DC in NR FR1 (three bands)

| NR or E-UTRA Band / Channel bandwidth / NRB / MSD | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- |
| EN-DC Configuration | EUTRA / NR band | UL Fc  (MHz) | UL/DL BW  (MHz) | UL  LCRB | DL Fc (MHz) | MSD  (dB) | IMD order |
| DC\_21A-42A\_n79AX  DC\_21A-42C\_n79AX | 21 | N/A | N/A | N/A | N/A | N/A | N/A |
|  | 42 | N/A | N/A | N/A | N/A | N/A | IMD2 |
|  | n79 | N/A | N/A | N/A | N/A | N/A | N/A |
| NOTE X: The frequency range in band n79 is restricted for this band combination to 4500 - 4600 MHz for both the UL and the DL. | | | | | | | |

#### 5.36.4 ∆TIB and ∆RIB values

There is no change by comparing to the values for PC3 DC, so this section is omitted.

5.37 DC\_28\_n41

5.37.1 Configuration for DC

When requested EN-DC configuration is 2DL2UL, it is not needed to update the inter-band EN-DC configuration table. By referring to the maximum output power table, it can be checked whether these configurations support PC2. This band combination for PC3 is already specified in TS 38.101-3, so this section is omitted.

5.37.2 Maximum output power for DC

**Table 5.37.2-1:** **Maximum output power for inter-band EN-DC (two bands)**

| **EN-DC configuration** | **Power class 2**  **(dBm)** | **Tolerance**  **(dB)** | **Power class 3**  **(dBm)** | **Tolerance**  **(dB)** |
| --- | --- | --- | --- | --- |
| DC\_28A\_n41A | 266 | +2/-3 | 23 | +2/-3 |
| NOTE 6: The UE supports PC3 within E-UTRA cell group, and supports either PC3 or PC2 within NR cell group. Power class support within each individual cell group is signaled separately by the UE. | | | | |

5.37.3 REFSENS requirements for DC

Analysis of REFSENS exceptions or MSD requirements is needed due to higher power UL DC.

* No harmonic issue
* No harmonic missing issue
* No IMD of dual UL fall into Rx frequencies of B28.
* No cross band isolation interference.

Thus, no PC2 MSD needs to be defined.

5.37.4 ∆TIB and ∆RIB values

There is no change by comparing to the values for PC3 DC.

5.38 DC\_28\_n77

5.38.1 Configuration for DC

When requested EN-DC configuration is 2DL2UL, it is not needed to update the inter-band EN-DC configuration table. By referring to the maximum output power table, it can be checked whether these configurations support PC2. This band combination for PC3 is already specified in TS 38.101-3, so this section is omitted.

5.38.2 Maximum output power for DC

**Table 5.38.2-1:** **Maximum output power for inter-band EN-DC (two bands)**

| **EN-DC configuration** | **Power class 2**  **(dBm)** | **Tolerance**  **(dB)** | **Power class 3**  **(dBm)** | **Tolerance**  **(dB)** |
| --- | --- | --- | --- | --- |
| DC\_28A\_n77A | 266 | +2/-3 | 23 | +2/-3 |
| NOTE 6: The UE supports PC3 within E-UTRA cell group, and supports either PC3 or PC2 within NR cell group. Power class support within each individual cell group is signaled separately by the UE. | | | | |

5.38.3 REFSENS requirements for DC

Analysis of REFSENS exceptions or MSD requirements is needed due to higher power UL DC.

* The 5th order harmonic of 28 fall into Rx frequencies of n77, but band 28 can only support PC3 so no need to introduce PC2 MSD due to harmonic.
* The 5th harmonic mixing falls into Rx frequencies of band 28.
* The 5th order IMD fall into Rx frequencies of n28.
* No cross band isolation interference.

New PC2 MSDs are defined in the following tables.

**Table 5.38.3-1: Reference sensitivity exceptions (MSD) due to receiver harmonic mixing for PC2 EN-DC in NR FR1**

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| E-UTRA or 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) | 40 MHz  (dB) | 50 MHz  (dB) | 60 MHz  (dB) | 80 MHz  (dB) | 90 MHz  (dB) | 100 MHz  (dB) |
| n77 | 281 | 31 | 28 | 26.2 | 25 |  |  |  |  |  |  |  |
| NOTE 1: The requirements should be verified for DL EARFCN of the victim (lower) band (superscript LB) such that  with  the DL carrier frequency in the lower band and the UL carrier frequency in the higher band, both in MHz. | | | | | | | | | | | | |

Note: The Uplink configuration for reference sensitivity exception table is omitted here which is the same as for PC3.

Table 5.38.3-2: MSD test points for PCell due to dual uplink operation for PC2 EN-DC in NR FR1 (two bands)

| **NR or E-UTRA Band / Channel bandwidth / NRB / MSD** | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **EN-DC**  **Configuration** | **EUTRA or NR band** | **UL Fc  (MHz)** | **UL/DL BW  (MHz)** | **UL  LCRB** | **DL Fc (MHz)** | **MSD  (dB)** | **IMD order** |
| DC\_28A\_n77A | 28 | 705.5 | 5 | 25 | 760.5 | 19.2 | IMD5 |
| n77 | 3582.5 | 10 | 50 | 3582.5 | N/A | N/A |

5.38.4 ∆TIB and ∆RIB values

There is no change by comparing to the values for PC3 DC.

### 5.39 DC\_19\_n77

#### 5.39.1 Configuration for DC

For DC\_19A\_n77A, EN-DC configuration is 2DL2UL without intra-band CA, so it is not needed to update the inter-band EN-DC configuration table. By referring to the maximum output power table, it can be checked whether these configurations support PC2. This band combination for PC3 is already specified in TS 38.101-3 [3], so this section is skipped.

On the other hand, for DC\_19A\_n77(2A), it is needed to update the inter-band EN-DC configuration table. The table is shown below.

Table 5.39.1-1: Inter-band EN-DC configurations within FR1 (two bands)

| **EN-DC**  **configuration** | **Uplink EN-DC**  **configuration**  **(NOTE 1)** | **Single UL allowed** | **DL interruption allowed**  **(Note 14)** |
| --- | --- | --- | --- |
| DC\_19A\_n77(2A)7, 21 | DC\_19A\_n77A21 | No |  |
| NOTE 1: Uplink EN-DC configurations are the configurations supported by the present release of specifications.  NOTE 7: Applicable for UE supporting inter-band EN-DC with mandatory simultaneous Rx/Tx capability.  NOTE 14: Applicable when dynamic switching between two uplink carriers is conducted. The DL interruption requirements for NR DL carrier(s) and E-UTRA DL carrier(s) are specified in clause 8.2.1.2.14 of 38.133 [15] and clause 7.32.2.12 of 36.133 [16] respectively.  NOTE 21: For this DC configuration, reference sensitivity exceptions for Power Class 2, if allowed, are specified in Clause 7.3B.2.3. If the uplink EN-DC configuration supported in Table 6.2B.1.3-1 is applicable to the same EN-DC configuration, the note is not shown as the reference sensitivity exceptions, if any, have been confirmed. | | | |

#### 5.39.2 Maximum output power for DC

**Table 5.39.2-1:** **Maximum output power for inter-band EN-DC (two bands)**

| EN-DC configuration | Power class 2  (dBm) | Tolerance  (dB) | Power class 3  (dBm) | Tolerance  (dB) |
| --- | --- | --- | --- | --- |
| DC\_19A\_n77A | 266,8 | +2/-3 | 23 | +2/-3 |
| NOTE 6: The UE supports PC3 within E-UTRA cell group, and supports either PC3 or PC2 within NR cell group. Power class support within each individual cell group is signaled separately by the UE.  NOTE 8: The UE that supports PC3 within a TDD or FDD band and supports PC2 within a second TDD band may signal a higherPowerLimit-r17 capability whereby the maximum output power indicated in the table may be exceeded in accordance with sub-clause 6.2B.4.1.3. | | | | |

#### 5.39.3 REFSENS requirements for DC

Analysis of REFSENS exceptions or MSD requirements is needed due to higher power UL DC. For PC3 DC\_19\_n77, the co-existence study is provided in TR 37.863-01-01 [4]. Based on above,

* the 4th order harmonic mixing from PC2 UL band n77 may impact the Rx frequencies of band 19.
* the 4th and 5th order IMD may impact the Rx frequencies of band 19.
* the 2nd and 5th order IMD may impact the Rx frequencies of band n77.

For MSD due to 4th order harmonic mixing, MSD value of PC2 case will be 3dB higher than that of PC3 case. Using the above simple calculation as a baseline, we reanalyzed the MSD values for PC2. New MSD values are shown in Table 5.39.3-1 below. Uplink configuration is shown in Table 5.39.3-2 below.

For MSD due to 4th order IMD generated by dual uplink of band 19 and band n77, the MSD value can be seen as dB related to 3rd order proportional of band 19 UL power + 1st order proportional of band n77 UL power. PC3 DC is assumed to be 20dBm + 20dBm and PC2 DC is assumed to be 23dBm + 23dBm. Therefore, MSD value of PC2 case will be 12dB higher than that of PC3 case. Using the above simple calculation as a baseline, we reanalyzed the MSD values for PC2. New MSD value is shown in Table 5.39.3-3 below.

It should be noted that IMD will not be an issue for band n77 (no self-interference for the TDD band) even through the IMD products may fall into the concerning band.

Table 5.39.3-1: Reference sensitivity exceptions (MSD) due to receiver harmonic mixing for PC2 EN-DC in NR FR1

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| E-UTRA or 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) | 40 MHz  (dB) | 50 MHz  (dB) | 60 MHz  (dB) | 80 MHz  (dB) | 90 MHz  (dB) | 100 MHz  (dB) |
| n77 | 19 | 9.8 | 7.2 | 5.8 |  |  |  |  |  |  |  |  |

Table 5.39.3-2: Uplink configuration for reference sensitivity exceptions due to receiver harmonic mixing for EN-DC in NR FR1

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| E-UTRA or NR Band / SCS / Channel bandwidth of the affected DL band / UL RB allocation of the agressor band | | | | | | | | | | | | | |
| UL band | DL band | SCS of UL band  (kHz) | 5 MHz  (LCRB) | 10 MHz  (LCRB) | 15 MHz  (LCRB) | 20 MHz  (LCRB) | 25 MHz  (LCRB) | 40 MHz  (LCRB) | 50 MHz  (LCRB) | 60 MHz  (LCRB) | 80 MHz  (LCRB) | 90 MHz  (LCRB) | 100 MHz  (LCRB) |
| n77 | 19 | 15 | 25 | 50 | 75 |  |  |  |  |  |  |  |  |

**Table 5.39.3-3: MSD test points for PCell due to dual uplink operation for PC2 EN-DC in NR FR1 (two bands)**

| NR or E-UTRA Band / Channel bandwidth / NRB / MSD | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- |
| EN-DC  Configuration | EUTRA or NR band | UL Fc  (MHz) | UL/DL BW  (MHz) | UL  LCRB | DL Fc (MHz) | MSD  (dB) | IMD order |
| DC\_19A\_n77A  DC\_19A\_n77(2A) | 19 | 836.5 | 5 | 25 | 881.5 | 25.3 | IMD4 |
|  | n77 | 3391 | 10 | 50 | 3391 | N/A | N/A |
|  | 19 | 832.5 | 5 | 25 | 877.5 | 8.1 | IMD5 |
|  | n77 | 4195 | 10 | 50 | 4195 | N/A | N/A |

#### 5.39.4 ∆TIB and ∆RIB values

There is no change by comparing to the values for PC3 DC, so this section is omitted.

### 5.40 DC\_19\_n78

#### 5.40.1 Configuration for DC

For DC\_19A\_n78A, EN-DC configuration is 2DL2UL without intra-band CA, so it is not needed to update the inter-band EN-DC configuration table. By referring to the maximum output power table, it can be checked whether these configurations support PC2. This band combination for PC3 is already specified in TS 38.101-3 [3], so this section is skipped.

On the other hand, for DC\_19A\_n78(2A), it is needed to update the inter-band EN-DC configuration table. The table is shown below.

Table 5.40.1-1: Inter-band EN-DC configurations within FR1 (two bands)

| **EN-DC**  **configuration** | **Uplink EN-DC**  **configuration**  **(NOTE 1)** | **Single UL allowed** | **DL interruption allowed**  **(Note 14)** |
| --- | --- | --- | --- |
| DC\_19A\_n78(2A)7, 21 | DC\_19A\_n78A21 | No | No |
| NOTE 1: Uplink EN-DC configurations are the configurations supported by the present release of specifications.  NOTE 7: Applicable for UE supporting inter-band EN-DC with mandatory simultaneous Rx/Tx capability.  NOTE 14: Applicable when dynamic switching between two uplink carriers is conducted. The DL interruption requirements for NR DL carrier(s) and E-UTRA DL carrier(s) are specified in clause 8.2.1.2.14 of 38.133 [15] and clause 7.32.2.12 of 36.133 [16] respectively.  NOTE 21: For this DC configuration, reference sensitivity exceptions for Power Class 2, if allowed, are specified in Clause 7.3B.2.3. If the uplink EN-DC configuration supported in Table 6.2B.1.3-1 is applicable to the same EN-DC configuration, the note is not shown as the reference sensitivity exceptions, if any, have been confirmed. | | | |

#### 5.40.2 Maximum output power for DC

**Table 5.40.2-1:** **Maximum output power for inter-band EN-DC (two bands)**

| EN-DC configuration | Power class 2  (dBm) | Tolerance  (dB) | Power class 3  (dBm) | Tolerance  (dB) |
| --- | --- | --- | --- | --- |
| DC\_19A\_n78A | 266,8 | +2/-3 | 23 | +2/-3 |
| NOTE 6: The UE supports PC3 within E-UTRA cell group, and supports either PC3 or PC2 within NR cell group. Power class support within each individual cell group is signaled separately by the UE.  NOTE 8: The UE that supports PC3 within a TDD or FDD band and supports PC2 within a second TDD band may signal a higherPowerLimit-r17 capability whereby the maximum output power indicated in the table may be exceeded in accordance with sub-clause 6.2B.4.1.3. | | | | |

#### 5.40.3 REFSENS requirements for DC

Analysis of REFSENS exceptions or MSD requirements is needed due to higher power UL DC. For PC3 DC\_19\_n78, the co-existence study is provided in TR 37.863-01-01 [4]. Based on above,

* the 4th order harmonic mixing from PC2 UL band n78 may impact the Rx frequencies of band 19.
* the 4th order IMD may impact the Rx frequencies of band 19.

For MSD due to 4th order harmonic mixing, MSD value of PC2 case will be 3dB higher than that of PC3 case. Using the above simple calculation as a baseline, we reanalyzed the MSD values for PC2. New MSD values are shown in Table 5.40.3-1 below. Uplink configuration is shown in Table 5.40.3-2 below.

For MSD due to 4th order IMD generated by dual uplink of band 19 and band n78, the MSD value can be seen as dB related to 3rd order proportional of band 19 UL power + 1st order proportional of band n78 UL power. PC3 DC is assumed to be 20dBm + 20dBm and PC2 DC is assumed to be 23dBm + 23dBm. Therefore, MSD value of PC2 case will be 12dB higher than that of PC3 case. Using the above simple calculation as a baseline, we reanalyzed the MSD values for PC2. New MSD value is shown in Table 5.40.3-3 below.

Table 5.40.3-1: Reference sensitivity exceptions (MSD) due to receiver harmonic mixing for PC2 EN-DC in NR FR1

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| E-UTRA or 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) | 40 MHz  (dB) | 50 MHz  (dB) | 60 MHz  (dB) | 80 MHz  (dB) | 90 MHz  (dB) | 100 MHz  (dB) |
| n78 | 19 | 9.8 | 7.2 | 5.8 |  |  |  |  |  |  |  |  |

Table 5.40.3-2: Uplink configuration for reference sensitivity exceptions due to receiver harmonic mixing for EN-DC in NR FR1

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| E-UTRA or NR Band / SCS / Channel bandwidth of the affected DL band / UL RB allocation of the agressor band | | | | | | | | | | | | | |
| UL band | DL band | SCS of UL band  (kHz) | 5 MHz  (LCRB) | 10 MHz  (LCRB) | 15 MHz  (LCRB) | 20 MHz  (LCRB) | 25 MHz  (LCRB) | 40 MHz  (LCRB) | 50 MHz  (LCRB) | 60 MHz  (LCRB) | 80 MHz  (LCRB) | 90 MHz  (LCRB) | 100 MHz  (LCRB) |
| n78 | 19 | 15 | 25 | 50 | 75 |  |  |  |  |  |  |  |  |

**Table 5.40.3-3: MSD test points for PCell due to dual uplink operation for PC2 EN-DC in NR FR1 (two bands)**

| NR or E-UTRA Band / Channel bandwidth / NRB / MSD | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- |
| EN-DC  Configuration | EUTRA or NR band | UL Fc  (MHz) | UL/DL BW  (MHz) | UL  LCRB | DL Fc (MHz) | MSD  (dB) | IMD order |
| DC\_19A\_n78A  DC\_19A\_n78(2A) | 19 | 836.5 | 5 | 25 | 881.5 | 25.3 | IMD4 |
|  | n78 | 3391 | 10 | 50 | 3391 | N/A | N/A |

#### 5.40.4 ∆TIB and ∆RIB values

There is no change by comparing to the values for PC3 DC, so this section is omitted.

### 5.41 DC\_1-19\_n77

#### 5.41.1 Configuration for DC

Table 5.41.1-1: Inter-band EN-DC configurations within FR1 (three bands)

| **EN-DC**  **configuration** | **Uplink EN-DC**  **configuration**  **(NOTE 1)** |
| --- | --- |
| DC\_1A-19A\_n77A5,14 | DC\_1A\_n77A14  DC\_19A\_n77A14 |
| DC\_1A-19A\_n77(2A)5,14 | DC\_1A\_n77A14  DC\_19A\_n77A14 |
| NOTE 1: Uplink EN-DC configurations are the configurations supported by the present release of specifications.  NOTE 5: Applicable for UE supporting inter-band EN-DC with mandatory simultaneous Rx/Tx capability  NOTE 14: PC3 or PC2 Uplink EN-DC configuration is applicable to EN-DC configurations. | |

#### 5.41.2 Maximum output power for DC

Based on studies of PC2 DC\_1\_n77 and PC2 DC\_19\_n77, this section can be omitted.

#### 5.41.3 REFSENS requirements for DC

Analysis of REFSENS exceptions or MSD requirements is needed due to higher power UL DC. Based on co-existence studies of DC\_1\_n77 and DC\_19\_n77 captured in TR 37.863-01-01 [3], own Rx impacts of the 3rd band are as follows:

* the 5th order IMD generated by dual uplink of band 1 and band n77 may impact the Rx frequencies of band 19.
* the 3rd order IMD generated by dual uplink of band 19 and band n77 may impact the Rx frequencies of band 1.

For MSD due to 5th order IMD generated by dual uplink of band 1 and band n77, the MSD value can be seen as dB related to 3rd order proportional of band 1 UL power + 2nd order proportional of band n77 UL power. PC3 DC is assumed to be 20dBm + 20dBm and PC2 DC is assumed to be 23dBm + 23dBm. Therefore, MSD value of PC2 case will be 15dB higher than that of PC3 case.

For MSD due to 3rd order IMD generated by dual uplink of band 19 and band n77, the MSD value can be seen as dB related to 2nd order proportional of band 19 UL power + 1st order proportional of band n77 UL power. PC3 DC is assumed to be 20dBm + 20dBm and PC2 DC is assumed to be 23dBm + 23dBm. Therefore, MSD value of PC2 case will be 9dB higher than that of PC3 case.

Using the above simple calculation as a baseline, we reanalyzed the MSD values for PC2. New MSD value is shown in Table 5.41.3-1 below.

Table 5.41.3-1: MSD test points for SCell due to dual uplink operation for PC2 EN-DC in NR FR1 (three bands)

| NR or E-UTRA Band / Channel bandwidth / NRB / MSD | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- |
| EN-DC Configuration | EUTRA / NR band | UL Fc  (MHz) | UL/DL BW  (MHz) | UL  LCRB | DL Fc (MHz) | MSD  (dB) | IMD order |
| DC\_1A-19A\_n77A  DC\_1A-19A\_n77(2A) | 1 | 1940 | 5 | 25 | 2130 | 26.7 | IMD3 |
|  | 19 | 832.5 | 5 | 25 | 877.5 | N/A | N/A |
|  | n77 | 3795 | 10 | 50 | 3795 | N/A | N/A |
|  | 1 | 1940 | 5 | 25 | 2130 | N/A | N/A |
|  | 19 | 835 | 5 | 25 | 880 | 18.5 | IMD5 |
|  | n77 | 3350 | 10 | 50 | 3350 | N/A | N/A |

#### 5.41.4 ∆TIB and ∆RIB values

There is no change by comparing to the values for PC3 DC, so this section is omitted.

### 5.42 DC\_1-19\_n78

#### 5.42.1 Configuration for DC

Table 5.42.1-1: Inter-band EN-DC configurations within FR1 (three bands)

| **EN-DC**  **configuration** | **Uplink EN-DC**  **configuration**  **(NOTE 1)** |
| --- | --- |
| DC\_1A-19A\_n78A5,14 | DC\_1A\_n78A14  DC\_19A\_n78A14 |
| DC\_1A-19A\_n78(2A)5,14 | DC\_1A\_n78A14  DC\_19A\_n78A14 |
| NOTE 1: Uplink EN-DC configurations are the configurations supported by the present release of specifications.  NOTE 5: Applicable for UE supporting inter-band EN-DC with mandatory simultaneous Rx/Tx capability  NOTE 14: PC3 or PC2 Uplink EN-DC configuration is applicable to EN-DC configurations. | |

#### 5.42.2 Maximum output power for DC

Based on studies of PC2 DC\_1\_n78 and PC2 DC\_19\_n78, this section can be omitted.

#### 5.42.3 REFSENS requirements for DC

Analysis of REFSENS exceptions or MSD requirements is needed due to higher power UL DC. Based on co-existence studies of DC\_1\_n78 and DC\_19\_n78 captured in TR 37.863-01-01 [3], own Rx impacts of the 3rd band are as follows:

* the 5th order IMD generated by dual uplink of band 1 and band n78 may impact the Rx frequencies of band 19.
* the 3rd order IMD generated by dual uplink of band 19 and band n78 may impact the Rx frequencies of band 1.

For MSD due to 5th order IMD generated by dual uplink of band 1 and band n78, the MSD value can be seen as dB related to 3rd order proportional of band 1 UL power + 2nd order proportional of band n78 UL power. PC3 DC is assumed to be 20dBm + 20dBm and PC2 DC is assumed to be 23dBm + 23dBm. Therefore, MSD value of PC2 case will be 15dB higher than that of PC3 case.

For MSD due to 3rd order IMD generated by dual uplink of band 19 and band n78, the MSD value can be seen as dB related to 2nd order proportional of band 19 UL power + 1st order proportional of band n78 UL power. PC3 DC is assumed to be 20dBm + 20dBm and PC2 DC is assumed to be 23dBm + 23dBm. Therefore, MSD value of PC2 case will be 9dB higher than that of PC3 case.

Using the above simple calculation as a baseline, we reanalyzed the MSD values for PC2. New MSD value is shown in Table 5.42.3-1 below.

Table 5.42.3-1: MSD test points for SCell due to dual uplink operation for PC2 EN-DC in NR FR1 (three bands)

| NR or E-UTRA Band / Channel bandwidth / NRB / MSD | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- |
| EN-DC Configuration | EUTRA / NR band | UL Fc  (MHz) | UL/DL BW  (MHz) | UL  LCRB | DL Fc (MHz) | MSD  (dB) | IMD order |
| DC\_1A-19A\_n78A  DC\_1A-19A\_n78(2A) | 1 | 1940 | 5 | 25 | 2130 | 26.7 | IMD3 |
|  | 19 | 832.5 | 5 | 25 | 877.5 | N/A | N/A |
|  | n78 | 3795 | 10 | 50 | 3795 | N/A | N/A |
|  | 1 | 1940 | 5 | 25 | 2130 | N/A | N/A |
|  | 19 | 835 | 5 | 25 | 880 | 18.5 | IMD5 |
|  | n78 | 3350 | 10 | 50 | 3350 | N/A | N/A |

#### 5.42.4 ∆TIB and ∆RIB values

There is no change by comparing to the values for PC3 DC, so this section is omitted.

### 5.43 DC\_3-19\_n77

#### 5.43.1 Configuration for DC

Table 5.43.1-1: Inter-band EN-DC configurations within FR1 (three bands)

| **EN-DC**  **configuration** | **Uplink EN-DC**  **configuration**  **(NOTE 1)** |
| --- | --- |
| DC\_3A-19A\_n77A5,14 | DC\_3A\_n77A14  DC\_19A\_n77A14 |
| DC\_3A-19A\_n77(2A)5,14 | DC\_3A\_n77A14  DC\_19A\_n77A14 |
| NOTE 1: Uplink EN-DC configurations are the configurations supported by the present release of specifications.  NOTE 5: Applicable for UE supporting inter-band EN-DC with mandatory simultaneous Rx/Tx capability  NOTE 14: PC3 or PC2 Uplink EN-DC configuration is applicable to EN-DC configurations. | |

#### 5.43.2 Maximum output power for DC

Based on studies of PC2 DC\_3\_n77 and PC2 DC\_19\_n77, this section can be omitted.

#### 5.43.3 REFSENS requirements for DC

Analysis of REFSENS exceptions or MSD requirements is needed due to higher power UL DC. Based on co-existence studies of DC\_3\_n77 and DC\_19\_n77 captured in TR 37.863-01-01 [3], own Rx impacts of the 3rd band are as follows:

* the 3rd order IMD generated by dual uplink of band 19 and band n77 may impact the Rx frequencies of band 3.

For MSD due to 3rd order IMD generated by dual uplink of band 19 and band n77, the MSD value can be seen as dB related to 2nd order proportional of band 19 UL power + 1st order proportional of band n77 UL power. PC3 DC is assumed to be 20dBm + 20dBm and PC2 DC is assumed to be 23dBm + 23dBm. Therefore, MSD value of PC2 case will be 9dB higher than that of PC3 case. Using the above simple calculation as a baseline, we reanalyzed the MSD values for PC2. New MSD value is shown in Table 5.43.3-1 below.

Table 5.43.3-1: MSD test points for SCell due to dual uplink operation for PC2 EN-DC in NR FR1 (three bands)

| NR or E-UTRA Band / Channel bandwidth / NRB / MSD | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- |
| EN-DC Configuration | EUTRA / NR band | UL Fc  (MHz) | UL/DL BW  (MHz) | UL  LCRB | DL Fc (MHz) | MSD  (dB) | IMD order |
| DC\_3A-19A\_n77A  DC\_3A-19A\_n77(2A) | 3 | 1775 | 5 | 25 | 1850 | 26.3 | IMD3 |
|  | 19 | 835 | 5 | 25 | 880 | N/A | N/A |
|  | n77 | 3520 | 10 | 50 | 3520 | N/A | N/A |

#### 5.43.4 ∆TIB and ∆RIB values

There is no change by comparing to the values for PC3 DC, so this section is omitted.

### 5.44 DC\_3-19\_n78

#### 5.44.1 Configuration for DC

Table 5.44.1-1: Inter-band EN-DC configurations within FR1 (three bands)

| **EN-DC**  **configuration** | **Uplink EN-DC**  **configuration**  **(NOTE 1)** |
| --- | --- |
| DC\_3A-19A\_n78A5,14 | DC\_3A\_n78A14  DC\_19A\_n78A14 |
| DC\_3A-19A\_n78(2A)5,14 | DC\_3A\_n78A14  DC\_19A\_n78A14 |
| NOTE 1: Uplink EN-DC configurations are the configurations supported by the present release of specifications.  NOTE 5: Applicable for UE supporting inter-band EN-DC with mandatory simultaneous Rx/Tx capability  NOTE 14: PC3 or PC2 Uplink EN-DC configuration is applicable to EN-DC configurations. | |

#### 5.44.2 Maximum output power for DC

Based on studies of PC2 DC\_3\_n78 and PC2 DC\_19\_n78, this section can be omitted.

#### 5.44.3 REFSENS requirements for DC

Analysis of REFSENS exceptions or MSD requirements is needed due to higher power UL DC. Based on co-existence studies of DC\_3\_n78 and DC\_19\_n78 captured in TR 37.863-01-01 [3], own Rx impacts of the 3rd band are as follows:

* the 3rd order IMD generated by dual uplink of band 19 and band n78 may impact the Rx frequencies of band 3.

For MSD due to 3rd order IMD generated by dual uplink of band 19 and band n78, the MSD value can be seen as dB related to 2nd order proportional of band 19 UL power + 1st order proportional of band n78 UL power. PC3 DC is assumed to be 20dBm + 20dBm and PC2 DC is assumed to be 23dBm + 23dBm. Therefore, MSD value of PC2 case will be 9dB higher than that of PC3 case. Using the above simple calculation as a baseline, we reanalyzed the MSD values for PC2. New MSD value is shown in Table 5.44.3-1 below.

Table 5.44.3-1: MSD test points for SCell due to dual uplink operation for PC2 EN-DC in NR FR1 (three bands)

| NR or E-UTRA Band / Channel bandwidth / NRB / MSD | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- |
| EN-DC Configuration | EUTRA / NR band | UL Fc  (MHz) | UL/DL BW  (MHz) | UL  LCRB | DL Fc (MHz) | MSD  (dB) | IMD order |
| DC\_3A-19A\_n78A  DC\_3A-19A\_n78(2A) | 3 | 1775 | 5 | 25 | 1850 | 26.3 | IMD3 |
|  | 19 | 835 | 5 | 25 | 880 | N/A | N/A |
|  | n78 | 3520 | 10 | 50 | 3520 | N/A | N/A |

#### 5.44.4 ∆TIB and ∆RIB values

There is no change by comparing to the values for PC3 DC, so this section is omitted.

### 5.45 DC\_19-21\_n77

#### 5.45.1 Configuration for DC

Table 5.45.1-1: Inter-band EN-DC configurations within FR1 (three bands)

| **EN-DC**  **configuration** | **Uplink EN-DC**  **configuration**  **(NOTE 1)** |
| --- | --- |
| DC\_19A-21A\_n77A5,14 | DC\_19A\_n77A14  DC\_21A\_n77A14 |
| DC\_19A-21A\_n77(2A)5,14 | DC\_19A\_n77A14  DC\_21A\_n77A14 |
| NOTE 1: Uplink EN-DC configurations are the configurations supported by the present release of specifications.  NOTE 5: Applicable for UE supporting inter-band EN-DC with mandatory simultaneous Rx/Tx capability  NOTE 14: PC3 or PC2 Uplink EN-DC configuration is applicable to EN-DC configurations. | |

#### 5.45.2 Maximum output power for DC

Based on studies of PC2 DC\_19\_n77 and PC2 DC\_21\_n77, this section can be omitted.

#### 5.45.3 REFSENS requirements for DC

Analysis of REFSENS exceptions or MSD requirements is needed due to higher power UL DC. Based on co-existence studies of DC\_19\_n77 and DC\_21\_n77 captured in TR 37.863-01-01 [3], own Rx impacts of the 3rd band are as follows:

* the 4th order IMD generated by dual uplink of band 19 and band n77 may impact the Rx frequencies of band 21.
* the 3rd and 4th order IMD generated by dual uplink of band 21 and band n77 may impact the Rx frequencies of band 19.

For MSD due to 4th order IMD generated by dual uplink of band 19 and band n77, the MSD value can be seen as dB related to 3rd order proportional of band 19 UL power + 1st order proportional of band n77 UL power. PC3 DC is assumed to be 20dBm + 20dBm and PC2 DC is assumed to be 23dBm + 23dBm. Therefore, MSD value of PC2 case will be 12dB higher than that of PC3 case.

For MSD due to 3rd order IMD generated by dual uplink of band 21 and band n77, the MSD value can be seen as dB related to 2nd order proportional of band 21 UL power + 1st order proportional of band n77 UL power. PC3 DC is assumed to be 20dBm + 20dBm and PC2 DC is assumed to be 23dBm + 23dBm. Therefore, MSD value of PC2 case will be 9dB higher than that of PC3 case.

For MSD due to 4th order IMD generated by dual uplink of band 21 and band n77, the MSD value can be seen as dB related to 3rd order proportional of band 21 UL power + 1st order proportional of band n77 UL power. PC3 DC is assumed to be 20dBm + 20dBm and PC2 DC is assumed to be 23dBm + 23dBm. Therefore, MSD value of PC2 case will be 12dB higher than that of PC3 case.

Based on above, new MSD value is shown in Table 5.45.3-1 below.

Table 5.45.3-1: MSD test points for SCell due to dual uplink operation for PC2 EN-DC in NR FR1 (three bands)

| NR or E-UTRA Band / Channel bandwidth / NRB / MSD | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- |
| EN-DC Configuration | EUTRA / NR band | UL Fc  (MHz) | UL/DL BW  (MHz) | UL  LCRB | DL Fc (MHz) | MSD  (dB) | IMD order |
| DC\_19A-21A\_n77A  DC\_19A-21A\_n77(2A) | 19 | 837.5 | 5 | 25 | 882.5 | 27.7 | IMD3 |
|  | 21 | 1450.4 | 5 | 25 | 1498.4 | N/A | N/A |
|  | n77 | 3783.3 | 10 | 50 | 3783.3 | N/A | N/A |
|  | 19 | 837.5 | 5 | 25 | 882.5 | 25.2 | IMD4 |
|  | 21 | 1450.4 | 5 | 25 | 1498.4 | N/A | N/A |
|  | n77 | 3468.7 | 10 | 50 | 3468.7 | N/A | N/A |
|  | 19 | 837.5 | 5 | 25 | 882.5 | N/A | N/A |
|  | 21 | 1454.5 | 5 | 25 | 1502.5 | 21.0 | IMD4 |
|  | n77 | 4015 | 10 | 50 | 4015 | N/A | N/A |

#### 5.45.4 ∆TIB and ∆RIB values

There is no change by comparing to the values for PC3 DC, so this section is omitted.

### 5.46 DC\_19-21\_n78

#### 5.46.1 Configuration for DC

Table 5.46.1-1: Inter-band EN-DC configurations within FR1 (three bands)

| **EN-DC**  **configuration** | **Uplink EN-DC**  **configuration**  **(NOTE 1)** |
| --- | --- |
| DC\_19A-21A\_n78A5,14 | DC\_19A\_n78A14  DC\_21A\_n78A14 |
| DC\_19A-21A\_n78(2A)5,14 | DC\_19A\_n78A14  DC\_21A\_n78A14 |
| NOTE 1: Uplink EN-DC configurations are the configurations supported by the present release of specifications.  NOTE 5: Applicable for UE supporting inter-band EN-DC with mandatory simultaneous Rx/Tx capability  NOTE 14: PC3 or PC2 Uplink EN-DC configuration is applicable to EN-DC configurations. | |

#### 5.46.2 Maximum output power for DC

Based on studies of PC2 DC\_19\_n78 and PC2 DC\_21\_n78, this section can be omitted.

#### 5.46.3 REFSENS requirements for DC

Analysis of REFSENS exceptions or MSD requirements is needed due to higher power UL DC. Based on co-existence studies of DC\_19\_n78 and DC\_21\_n78 captured in TR 37.863-01-01 [3], own Rx impacts of the 3rd band are as follows:

* the 3rd and 4th order IMD generated by dual uplink of band 21 and band n78 may impact the Rx frequencies of band 19.

For MSD due to 3rd order IMD generated by dual uplink of band 21 and band n78, the MSD value can be seen as dB related to 2nd order proportional of band 21 UL power + 1st order proportional of band n78 UL power. PC3 DC is assumed to be 20dBm + 20dBm and PC2 DC is assumed to be 23dBm + 23dBm. Therefore, MSD value of PC2 case will be 9dB higher than that of PC3 case.

For MSD due to 4th order IMD generated by dual uplink of band 21 and band n78, the MSD value can be seen as dB related to 3rd order proportional of band 21 UL power + 1st order proportional of band n78 UL power. PC3 DC is assumed to be 20dBm + 20dBm and PC2 DC is assumed to be 23dBm + 23dBm. Therefore, MSD value of PC2 case will be 12dB higher than that of PC3 case.

Based on above, new MSD value is shown in Table 5.46.3-1 below.

Table 5.46.3-1: MSD test points for SCell due to dual uplink operation for PC2 EN-DC in NR FR1 (three bands)

| NR or E-UTRA Band / Channel bandwidth / NRB / MSD | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- |
| EN-DC Configuration | EUTRA / NR band | UL Fc  (MHz) | UL/DL BW  (MHz) | UL  LCRB | DL Fc (MHz) | MSD  (dB) | IMD order |
| DC\_19A-21A\_n78A  DC\_19A-21A\_n78(2A) | 19 | 837.5 | 5 | 25 | 882.5 | 27.7 | IMD3 |
|  | 21 | 1450.4 | 5 | 25 | 1498.4 | N/A | N/A |
|  | n78 | 3783.3 | 10 | 50 | 3783.3 | N/A | N/A |
|  | 19 | 837.5 | 5 | 25 | 882.5 | 25.2 | IMD4 |
|  | 21 | 1450.4 | 5 | 25 | 1498.4 | N/A | N/A |
|  | n78 | 3468.7 | 10 | 50 | 3468.7 | N/A | N/A |

#### 5.46.4 ∆TIB and ∆RIB values

There is no change by comparing to the values for PC3 DC, so this section is omitted.

### 5.47 DC\_19-42\_n77

#### 5.47.1 Configuration for DC

Table 5.47.1-1: Inter-band EN-DC configurations within FR1 (three bands)

| **EN-DC**  **configuration** | **Uplink EN-DC**  **configuration**  **(NOTE 1)** |
| --- | --- |
| DC\_19A-42A\_n77A14,15,16  DC\_19A-42C\_n77A14,15,16 | DC\_19A\_n77A14 |
| NOTE 1: Uplink EN-DC configurations are the configurations supported by the present release of specifications.  NOTE 14: PC3 or PC2 Uplink EN-DC configuration is applicable to EN-DC configurations.  NOTE 15: For UEs not indicating *interBandMRDC-WithOverlapDL-Bands-r16*, the minimum requirements for intra-band non-contiguous EN-DC apply for the Band 42/48 and Band n77/n78 combination and for the Band 2 and Band n25 combinations. For UEs not indicating *interBandMRDC-WithOverlapDL-Bands-r16*, when UE capability *interBandContiguousMRDC* is indicated, the minimum requirements for intra-band-contiguous EN-DC also should be met in addtion to intra-band non-contiguous EN-DC*.*  NOTE 16: For UEs not indicating *interBandMRDC-WithOverlapDL-Bands-r16*, the minimum requirements for inter-band EN-DC apply when the maximum power spectral density imbalance between downlink carriers contained in overlapping or partially overlapping DL bands is within 6 dB. | |

#### 5.47.2 Maximum output power for DC

Based on studies of PC2 DC\_19\_n77, this section can be omitted.

#### 5.47.3 REFSENS requirements for DC

Analysis of REFSENS exceptions or MSD requirements is needed due to higher power UL DC. Based on co-existence studies of DC\_19\_n77 captured in TR 37.863-01-01 [2], own Rx impacts of the 3rd band are as follows:

* the 2nd, 3rd, 4th, and 5th order IMD do not impact the Rx frequencies of band n77.

Therefore, there is no MSD issue for this DC configuration.

#### 5.47.4 ∆TIB and ∆RIB values

There is no change by comparing to the values for PC3 DC, so this section is omitted.

### 5.48 DC\_19-42\_n78

#### 5.48.1 Configuration for DC

Table 5.48.1-1: Inter-band EN-DC configurations within FR1 (three bands)

| **EN-DC**  **configuration** | **Uplink EN-DC**  **configuration**  **(NOTE 1)** |
| --- | --- |
| DC\_19A-42A\_n78A14,15,16  DC\_19A-42C\_n78A14,15,16 | DC\_19A\_n78A14 |
| NOTE 1: Uplink EN-DC configurations are the configurations supported by the present release of specifications.  NOTE 14: PC3 or PC2 Uplink EN-DC configuration is applicable to EN-DC configurations.  NOTE 15: For UEs not indicating *interBandMRDC-WithOverlapDL-Bands-r16*, the minimum requirements for intra-band non-contiguous EN-DC apply for the Band 42/48 and Band n78/n78 combination and for the Band 2 and Band n25 combinations. For UEs not indicating *interBandMRDC-WithOverlapDL-Bands-r16*, when UE capability *interBandContiguousMRDC* is indicated, the minimum requirements for intra-band-contiguous EN-DC also should be met in addtion to intra-band non-contiguous EN-DC*.*  NOTE 16: For UEs not indicating *interBandMRDC-WithOverlapDL-Bands-r16*, the minimum requirements for inter-band EN-DC apply when the maximum power spectral density imbalance between downlink carriers contained in overlapping or partially overlapping DL bands is within 6 dB. | |

#### 5.48.2 Maximum output power for DC

Based on studies of PC2 DC\_19\_n78, this section can be omitted.

#### 5.48.3 REFSENS requirements for DC

Analysis of REFSENS exceptions or MSD requirements is needed due to higher power UL DC. Based on co-existence studies of DC\_19\_n78 captured in TR 37.863-01-01 [2], own Rx impacts of the 3rd band are as follows:

* the 2nd, 3rd, 4th, and 5th order IMD do not impact the Rx frequencies of band n78.

Therefore, there is no MSD issue for this DC configuration.

#### 5.48.4 ∆TIB and ∆RIB values

There is no change by comparing to the values for PC3 DC, so this section is omitted.

### 5.49 DC\_19\_n77-n79

#### 5.49.1 Configuration for DC

Table 5.49.1-1: Inter-band EN-DC configurations within FR1 (three bands)

| **EN-DC**  **configuration** | **Uplink EN-DC**  **configuration**  **(NOTE 1)** |
| --- | --- |
| DC\_19A\_n77A-n79A14 | DC\_19A\_n77A14  DC\_19A\_n79A14 |
| NOTE 1: Uplink EN-DC configurations are the configurations supported by the present release of specifications.  NOTE 14: PC3 or PC2 Uplink EN-DC configuration is applicable to EN-DC configurations. | |

#### 5.49.2 Maximum output power for DC

Based on studies of PC2 DC\_19\_n77 and PC2 DC\_19\_n79, this section can be omitted.

#### 5.49.3 REFSENS requirements for DC

Analysis of REFSENS exceptions or MSD requirements is needed due to higher power UL DC. Based on co-existence studies of DC\_19\_n77 and DC\_19\_n79 captured in TR 37.863-01-01 [2], own Rx impacts of the 3rd band are as follows:

* the 2nd, 3rd, 4th, and 5th order IMD generated by dual uplink of band 19 and band n77 may impact the Rx frequencies of band n79.
* the 2nd and 3rd order IMD generated by dual uplink of band 19 and band n79 may impact the Rx frequencies of band n77.

However, IMD will not be an issue because the minimum requirements apply only when there is non-simultaneous Rx/Tx operation between n77-n79 NR carriers. Therefore, there is no MSD issue for this DC configuration.

#### 5.49.4 ∆TIB and ∆RIB values

There is no change by comparing to the values for PC3 DC, so this section is omitted.

### 5.50 DC\_19\_n78-n79

#### 5.50.1 Configuration for DC

Table 5.50.1-1: Inter-band EN-DC configurations within FR1 (three bands)

| **EN-DC**  **configuration** | **Uplink EN-DC**  **configuration**  **(NOTE 1)** |
| --- | --- |
| DC\_19A\_n78A-n79A14 | DC\_19A\_n78A14  DC\_19A\_n79A14 |
| NOTE 1: Uplink EN-DC configurations are the configurations supported by the present release of specifications.  NOTE 14: PC3 or PC2 Uplink EN-DC configuration is applicable to EN-DC configurations. | |

#### 5.50.2 Maximum output power for DC

Based on studies of PC2 DC\_19\_n78 and PC2 DC\_19\_n79, this section can be omitted.

#### 5.50.3 REFSENS requirements for DC

Analysis of REFSENS exceptions or MSD requirements is needed due to higher power UL DC. Based on co-existence studies of DC\_19\_n78 and DC\_19\_n79 captured in TR 37.863-01-01 [2], own Rx impacts of the 3rd band are as follows:

* the 2nd, 3rd, 4th, and 5th order IMD generated by dual uplink of band 19 and band n78 may impact the Rx frequencies of band n79.
* the 2nd and 3rd order IMD generated by dual uplink of band 19 and band n79 may impact the Rx frequencies of band n78.

For MSD due to 2nd order IMD generated by dual uplink of band 19 and band n78, the MSD value can be seen as dB related to 1st order proportional of band 19 UL power + 1st order proportional of band n78 UL power. PC3 DC is assumed to be 20dBm + 20dBm and PC2 DC is assumed to be 23dBm + 23dBm. Therefore, MSD value of PC2 case will be 6dB higher than that of PC3 case.

For MSD due to 2nd order IMD generated by dual uplink of band 19 and band n79, the MSD value can be seen as dB related to 1st order proportional of band 19 UL power + 1st order proportional of band n79 UL power. PC3 DC is assumed to be 20dBm + 20dBm and PC2 DC is assumed to be 23dBm + 23dBm. Therefore, MSD value of PC2 case will be 6dB higher than that of PC3 case.

Based on above, new MSD value is shown in Table 5.50.3-1 below.

Table 5.50.3-1: MSD test points for SCell due to dual uplink operation for PC2 EN-DC in NR FR1 (three bands)

| NR or E-UTRA Band / Channel bandwidth / NRB / MSD | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- |
| EN-DC Configuration | EUTRA / NR band | UL Fc  (MHz) | UL/DL BW  (MHz) | UL  LCRB | DL Fc (MHz) | MSD  (dB) | IMD order |
| DC\_19A\_n78A-n79A | 19 | 835 | 5 | 25 | 880 | N/A | N/A |
|  | n78 | 3680 | 10 | 50 | 3680 | N/A | N/A |
|  | n79 | 4515 | 40 | 216 | 4515 | 35.3 | IMD2 |
|  | 19 | 835 | 5 | 25 | 880 | N/A | N/A |
|  | n78 | 3715 | 10 | 50 | 3715 | 34.8 | IMD2 |
|  | n79 | 4550 | 40 | 216 | 4550 | N/A | N/A |

#### 5.50.4 ∆TIB and ∆RIB values

There is no change by comparing to the values for PC3 DC, so this section is omitted.

### 5.51 DC\_1-21\_n78

#### 5.51.1 Configuration for DC

Table 5.51.1-1: Inter-band EN-DC configurations within FR1 (three bands)

| **EN-DC**  **configuration** | **Uplink EN-DC**  **configuration**  **(NOTE 1)** |
| --- | --- |
| DC\_1A-21A\_n78A5,14 | DC\_1A\_n78A14  DC\_21A\_n78A14 |
| DC\_1A-21A\_n78(2A)5,14 | DC\_1A\_n78A14  DC\_21A\_n78A14 |
| NOTE 1: Uplink EN-DC configurations are the configurations supported by the present release of specifications.  NOTE 5: Applicable for UE supporting inter-band EN-DC with mandatory simultaneous Rx/Tx capability  NOTE 14: PC3 or PC2 Uplink EN-DC configuration is applicable to EN-DC configurations. | |

#### 5.51.2 Maximum output power for DC

Based on studies of PC2 DC\_1\_n78 and PC2 DC\_21\_n78, this section can be omitted.

#### 5.51.3 REFSENS requirements for DC

Analysis of REFSENS exceptions or MSD requirements is needed due to higher power UL DC. Based on co-existence studies of DC\_1\_n78 and DC\_21\_n78 captured in TR 37.863-01-01 [3], own Rx impacts of the 3rd band are as follows:

* the 2nd and 5th order IMD generated by dual uplink of band 1 and band n78 may impact the Rx frequencies of band 21.
* the 2nd and 5th order IMD generated by dual uplink of band 21 and band n78 may impact the Rx frequencies of band 1.

For MSD due to 2nd order IMD generated by dual uplink of band 1 and band n78, the MSD value can be seen as dB related to 1st order proportional of band 1 UL power + 1st order proportional of band n78 UL power. PC3 DC is assumed to be 20dBm + 20dBm and PC2 DC is assumed to be 23dBm + 23dBm. Therefore, MSD value of PC2 case will be 6dB higher than that of PC3 case.

For MSD due to 5th order IMD generated by dual uplink of band 1 and band n78, the MSD value can be seen as dB related to 3rd order proportional of band 1 UL power + 2nd order proportional of band n78 UL power. PC3 DC is assumed to be 20dBm + 20dBm and PC2 DC is assumed to be 23dBm + 23dBm. Therefore, MSD value of PC2 case will be 15dB higher than that of PC3 case.

For MSD due to 2nd order IMD generated by dual uplink of band 21 and band n78, the MSD value can be seen as dB related to 1st order proportional of band 21 UL power + 1st order proportional of band n78 UL power. PC3 DC is assumed to be 20dBm + 20dBm and PC2 DC is assumed to be 23dBm + 23dBm. Therefore, MSD value of PC2 case will be 6dB higher than that of PC3 case.

For MSD due to 5th order IMD generated by dual uplink of band 21 and band n78, the MSD value can be seen as dB related to 4th order proportional of band 21 UL power + 1st order proportional of band n78 UL power. PC3 DC is assumed to be 20dBm + 20dBm and PC2 DC is assumed to be 23dBm + 23dBm. Therefore, MSD value of PC2 case will be 15dB higher than that of PC3 case.

Using the above simple calculation as a baseline, we reanalyzed the MSD values for PC2. New MSD value is shown in Table 5.51.3-1 below.

Table 5.51.3-1: MSD test points for SCell due to dual uplink operation for PC2 EN-DC in NR FR1 (three bands)

| NR or E-UTRA Band / Channel bandwidth / NRB / MSD | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- |
| EN-DC Configuration | EUTRA / NR band | UL Fc  (MHz) | UL/DL BW  (MHz) | UL  LCRB | DL Fc (MHz) | MSD  (dB) | IMD order |
| DC\_1A-21A\_n78A  DC\_1A-21A\_n78(2A) | 1 | 1964.6 | 5 | 25 | 2154.6 | 36.6 | IMD2 |
|  | 21 | 1450.4 | 5 | 25 | 1498.4 | N/A | N/A |
|  | n78 | 3605 | 10 | 50 | 3605 | N/A | N/A |
|  | 1 | 1964.6 | 5 | 25 | 2154.6 | 16.2 | IMD5 |
|  | 21 | 1450.4 | 5 | 25 | 1498.4 | N/A | N/A |
|  | n78 | 3647 | 10 | 50 | 3647 | N/A | N/A |
|  | 1 | 1950 | 5 | 25 | 2140 | N/A | N/A |
|  | 21 | 1452 | 5 | 25 | 1500 | 37.5 | IMD2 |
|  | n78 | 3450 | 10 | 50 | 3450 | N/A | N/A |
|  | 1 | 1950 | 5 | 25 | 2140 | N/A | N/A |
|  | 21 | 1452 | 5 | 25 | 1500 | 14.9 | IMD5 |
|  | n78 | 3675 | 10 | 50 | 3675 | N/A | N/A |

#### 5.51.4 ∆TIB and ∆RIB values

There is no change by comparing to the values for PC3 DC, so this section is omitted.

### 5.52 DC\_3-21\_n78

#### 5.52.1 Configuration for DC

Table 5.52.1-1: Inter-band EN-DC configurations within FR1 (three bands)

| **EN-DC**  **configuration** | **Uplink EN-DC**  **configuration**  **(NOTE 1)** |
| --- | --- |
| DC\_3A-21A\_n78A5,14 | DC\_3A\_n78A14  DC\_21A\_n78A14 |
| DC\_3A-21A\_n78(2A)5,14 | DC\_3A\_n78A14  DC\_21A\_n78A14 |
| NOTE 1: Uplink EN-DC configurations are the configurations supported by the present release of specifications.  NOTE 5: Applicable for UE supporting inter-band EN-DC with mandatory simultaneous Rx/Tx capability  NOTE 14: PC3 or PC2 Uplink EN-DC configuration is applicable to EN-DC configurations. | |

#### 5.52.2 Maximum output power for DC

Based on studies of PC2 DC\_3\_n78 and PC2 DC\_21\_n78, this section can be omitted.

#### 5.52.3 REFSENS requirements for DC

Analysis of REFSENS exceptions or MSD requirements is needed due to higher power UL DC. Based on co-existence studies of DC\_3\_n78 and DC\_21\_n78 captured in TR 37.863-01-01 [3], own Rx impacts of the 3rd band are as follows:

* the 4th and 5th order IMD generated by dual uplink of band 1 and band n78 may impact the Rx frequencies of band 21.
* the 2nd order IMD generated by dual uplink of band 21 and band n78 may impact the Rx frequencies of band 3.

For MSD due to 4th order IMD generated by dual uplink of band 3 and band n78, the MSD value can be seen as dB related to 3rd order proportional of band 3 UL power + 1st order proportional of band n78 UL power. PC3 DC is assumed to be 20dBm + 20dBm and PC2 DC is assumed to be 23dBm + 23dBm. Therefore, MSD value of PC2 case will be 12dB higher than that of PC3 case.

For MSD due to 5th order IMD generated by dual uplink of band 3 and band n78, the MSD value can be seen as dB related to 3rd order proportional of band 3 UL power + 2nd order proportional of band n78 UL power. PC3 DC is assumed to be 20dBm + 20dBm and PC2 DC is assumed to be 23dBm + 23dBm. Therefore, MSD value of PC2 case will be 15dB higher than that of PC3 case.

For MSD due to 2nd order IMD generated by dual uplink of band 21 and band n78, the MSD value can be seen as dB related to 1st order proportional of band 21 UL power + 1st order proportional of band n78 UL power. PC3 DC is assumed to be 20dBm + 20dBm and PC2 DC is assumed to be 23dBm + 23dBm. Therefore, MSD value of PC2 case will be 6dB higher than that of PC3 case.

Using the above simple calculation as a baseline, we reanalyzed the MSD values for PC2. New MSD value is shown in Table 5.52.3-1 below.

Table 5.52.3-1: MSD test points for SCell due to dual uplink operation for PC2 EN-DC in NR FR1 (three bands)

| NR or E-UTRA Band / Channel bandwidth / NRB / MSD | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- |
| EN-DC Configuration | EUTRA / NR band | UL Fc  (MHz) | UL/DL BW  (MHz) | UL  LCRB | DL Fc (MHz) | MSD  (dB) | IMD order |
| DC\_3A-21A\_n78A  DC\_3A-21A\_n78(2A) | 3 | 1767.5 | 5 | 25 | 1862.5 | 36.6 | IMD2 |
|  | 21 | 1459.5 | 5 | 25 | 1507.5 | N/A | N/A |
|  | n78 | 3322 | 10 | 50 | 3322 | N/A | N/A |
|  | 3 | 1767.5 | 5 | 25 | 1862.5 | N/A | N/A |
|  | 21 | 1459.5 | 5 | 25 | 1507.5 | 23.2 | IMD4 |
|  | n78 | 3795 | 10 | 50 | 3795 | N/A | N/A |
|  | 3 | 1767.5 | 5 | 25 | 1862.5 | N/A | N/A |
|  | 21 | 1455.5 | 5 | 25 | 1503.5 | 9.5 | IMD5 |
|  | n78 | 3403 | 10 | 50 | 3403 | N/A | N/A |

#### 5.52.4 ∆TIB and ∆RIB values

There is no change by comparing to the values for PC3 DC, so this section is omitted.

### 5.53 DC\_3\_n1-n78, DC\_3-3\_n1-n78

#### 5.53.1 Configuration for DC

Table 5.53.1-1: Inter-band EN-DC configurations within FR1 (three bands)

| **EN-DC**  **configuration** | **Uplink EN-DC**  **configuration**  **(NOTE 1)** |
| --- | --- |
| DC\_3A\_n1A-n78A5, **14** | DC\_3A\_n1A  DC\_3A\_n78A**14** |
| DC\_3A-3A\_n1A-n78A5, **14** | DC\_3A\_n1A  DC\_3A\_n78A**14** |
| NOTE 14: PC3 or PC2 Uplink EN-DC configuration is applicable to EN-DC configurations. | |

Note that the note 5 already existed in the specification for these combinations.

#### 5.53.2 Maximum output power for DC

Since the maximum output power requirement for PC2 UL DC\_3A\_n78 is already specified in the specification, this section can be omitted.

#### 5.53.3 REFSENS requirements for DC

Based on co-existence studies of DC\_3\_n78 captured in TR 37.863-01-01, own Rx impacts of the 3rd band are as follows:

* The 5th order IMD generated by dual uplink of band 3 and band n78 may impact the Rx frequencies of band n1.

The MSD values for IMD5 reused the value for PC2 DC\_1A-3A\_n78A in section 5.23.

Table 5.53.3-1: MSD test points for SCell due to dual uplink operation for PC2 EN-DC in NR FR1 (three bands)

| NR or E-UTRA Band / Channel bandwidth / NRB / MSD | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- |
| EN-DC Configuration | EUTRA / NR band | UL Fc  (MHz) | UL/DL BW  (MHz) | UL  LCRB | DL Fc (MHz) | MSD  (dB) | IMD order |
| DC\_3A\_n1A-n78A  DC\_3A-3A\_n1A-n78A | 3 | 1770 | 5 | 25 | 1865 | N/A | N/A |
|  | n1 | 1940 | 5 | 25 | 2130 | 17.8 | IMD5 |
|  | n78 | 3720 | 10 | 50 | 3720 | N/A | N/A |

#### 5.53.4 ∆TIB and ∆RIB values

There is no change by comparing to the values for PC3 DC, so this section is omitted.

### 5.y DC\_7\_n1-n78, DC\_7-7\_n1-n78

#### 5.54.1 Configuration for DC

Table 5.54.1-1: Inter-band EN-DC configurations within FR1 (three bands)

| **EN-DC**  **configuration** | **Uplink EN-DC**  **configuration**  **(NOTE 1)** |
| --- | --- |
| DC\_7A\_n1A-n78A5, **14** | DC\_7A\_n1A  DC\_7A\_n78A**14** |
| DC\_7A-7A\_n1A-n78A5, **14** | DC\_7A\_n1A  DC\_7A\_n78A**14** |
| NOTE 14: PC3 or PC2 Uplink EN-DC configuration is applicable to EN-DC configurations. | |

Note that the note 5 already existed in the specification for these combinations.

#### 5.54.2 Maximum output power for DC

Since the maximum output power requirement for PC2 UL DC\_7A\_n78 is already specified in the specification, this section can be omitted.

#### 5.54.3 REFSENS requirements for DC

Based on co-existence studies of DC\_7\_n78 captured in TR 37.863-01-01, own Rx impacts of the 3rd band are as follows:

- The 4th order IMD generated by dual uplink of band 7 and band n78 may impact the Rx frequencies of band n1.

The MSD values for IMD5 reused the value for PC2 DC\_1A-7A\_n78A in the specifications.

Table 5.54.3-1: MSD test points for SCell due to dual uplink operation for PC2 EN-DC in NR FR1 (three bands)

| NR or E-UTRA Band / Channel bandwidth / NRB / MSD | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- |
| EN-DC Configuration | EUTRA / NR band | UL Fc  (MHz) | UL/DL BW  (MHz) | UL  LCRB | DL Fc (MHz) | MSD  (dB) | IMD order |
| DC\_7A\_n1A-n78A  DC\_7A-7A\_n1A-n78A | 1 | 1950 | 5 | 25 | 2140 | 19.7 | IMD4 |
|  | 7 | 2510 | 10 | 50 | 2630 | N/A | N/A |
|  | n78 | 3580 | 10 | 50 | 3580 | N/A | N/A |

#### 5.54.4 ∆TIB and ∆RIB values

There is no change by comparing to the values for PC3 DC, so this section is omitted.

5.55 DC\_1-8\_n77

5.55.1 Configuration for DC

**Table 5.55.1-1: Inter-band EN-DC configurations within FR1 (three bands)**

| **EN-DC**  **configuration** | **Uplink EN-DC**  **configuration**  **(NOTE 1)** |
| --- | --- |
| DC\_1A-8A\_n77A5,14 | DC\_1A\_n77A14  DC\_8A\_n77A14 |
| DC\_1A-8A\_n77(2A)5,14 | DC\_1A\_n77A14  DC\_8A\_n77A14 |
| NOTE 1: Uplink EN-DC configurations are the configurations supported by the present release of specifications.  NOTE 5: Applicable for UE supporting inter-band EN-DC with mandatory simultaneous Rx/Tx capability  NOTE 14: PC3 or PC2 Uplink EN-DC configuration is applicable to EN-DC configurations. | |

5.55.2 Maximum output power for DC

Based on studies of PC2 DC\_1\_n77 and PC2 DC\_8\_n77, this section can be omitted.

5.55.3 REFSENS requirements for DC

Analysis of REFSENS exceptions or MSD requirements is needed due to higher power UL DC. Based on co-existence studies of DC\_1\_n77 and DC\_8\_n77, own Rx impact of the 3rd band is the followings.

* the 5th order IMD generated by dual uplink of band 1 and band n77 may also impact the own Rx of band 8.
* the 3nd order IMD generated by dual uplink of band 8 and band n77 may also impact the own Rx of band 1.

The new MSDs are specified in below table.

**Table 5.55.3-1: MSD test points for Scell due to dual uplink operation for PC2 EN-DC in NR FR1 (three bands)**

| **NR or E-UTRA Band / Channel bandwidth / NRB / MSD** | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **EN-DC Configuration** | **EUTRA / NR band** | **UL Fc  (MHz)** | **UL/DL BW  (MHz)** | **UL**  **LCRB** | **DL Fc (MHz)** | **MSD  (dB)** | **IMD order** |
| DC\_1A-8A\_n77A | 1 | 1955 | 5 | 25 | 2145 | N/A | N/A |
| DC\_1A-8A\_n77(2A) | n77 | 3410 | 10 | 50 | 3410 | N/A | N/A |
|  | 8 | 910 | 5 | 25 | 955 | 15.7 | IMD5 |
|  | 8 | 910 | 5 | 25 | 955 | N/A | N/A |
|  | n77 | 3960 | 10 | 50 | 3960 | N/A | N/A |
|  | 1 | 1950 | 5 | 25 | 2140 | 23.4 | IMD3 |

5.55.4 ∆TIB and ∆RIB values

There is no change by comparing to the values for PC3 DC, so this section is omitted.

5.56 DC\_1-8\_n78

5.56.1 Configuration for DC

**Table 5.56.1-1: Inter-band EN-DC configurations within FR1 (three bands)**

| **EN-DC**  **configuration** | **Uplink EN-DC**  **configuration**  **(NOTE 1)** |
| --- | --- |
| DC\_1A-8A\_n78A5,14 | DC\_1A\_n78A14  DC\_8A\_n78A14 |
| DC\_1A-8A\_n78(2A)5,14 | DC\_1A\_n78A14  DC\_8A\_n78A14 |
| NOTE 1: Uplink EN-DC configurations are the configurations supported by the present release of specifications.  NOTE 5: Applicable for UE supporting inter-band EN-DC with mandatory simultaneous Rx/Tx capability  NOTE 14: PC3 or PC2 Uplink EN-DC configuration is applicable to EN-DC configurations. | |

5.56.2 Maximum output power for DC

Based on studies of PC2 DC\_1\_n78 and PC2 DC\_8\_n78, this section can be omitted.

5.56.3 REFSENS requirements for DC

Analysis of REFSENS exceptions or MSD requirements is needed due to higher power UL DC. Based on co-existence studies of DC\_1\_n78 and DC\_8\_n78, own Rx impact of the 3rd band is the followings.

* the 5th order IMD generated by dual uplink of band 1 and band n78 may also impact the own Rx of band 8.
* IMD generated by dual uplink of band 8 and band n78 have no impact on the own Rx of band 1.

The new MSDs are specified in below table.

**Table 5.56.3-1: MSD test points for Scell due to dual uplink operation for PC2 EN-DC in NR FR1 (three bands)**

| **NR or E-UTRA Band / Channel bandwidth / NRB / MSD** | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **EN-DC Configuration** | **EUTRA / NR band** | **UL Fc  (MHz)** | **UL/DL BW  (MHz)** | **UL**  **LCRB** | **DL Fc (MHz)** | **MSD  (dB)** | **IMD order** |
| DC\_1A-8A\_n78A | 1 | 1955 | 5 | 25 | 2145 | N/A | N/A |
| DC\_1A-8A\_n78(2A) | n78 | 3410 | 10 | 50 | 3410 | N/A | N/A |
|  | 8 | 910 | 5 | 25 | 955 | 15.7 | IMD5 |

5.56.4 ∆TIB and ∆RIB values

There is no change by comparing to the values for PC3 DC.

5.57 DC\_3-8\_n77

5.57.1 Configuration for DC

**Table 5.57.1-1: Inter-band EN-DC configurations within FR1 (three bands)**

| **EN-DC**  **configuration** | **Uplink EN-DC**  **configuration**  **(NOTE 1)** |
| --- | --- |
| DC\_3A-8A\_n77A5,14  DC\_3C-8A\_n77A5,14 | DC\_3A\_n77A14  DC\_8A\_n77A14 |
| DC\_3A-8A\_n77(2A) 5,14  DC\_3C-8A\_n77(2A)5,14 | DC\_3A\_n77A14  DC\_8A\_n77A14 |
| NOTE 1: Uplink EN-DC configurations are the configurations supported by the present release of specifications.  NOTE 5: Applicable for UE supporting inter-band EN-DC with mandatory simultaneous Rx/Tx capability  NOTE 14: PC3 or PC2 Uplink EN-DC configuration is applicable to EN-DC configurations. | |

5.57.2 Maximum output power for DC

Based on studies of PC2 DC\_3\_n77 and PC2 DC\_8\_n77, this section can be omitted.

5.57.3 REFSENS requirements for DC

Analysis of REFSENS exceptions or MSD requirements is needed due to higher power UL DC. Based on co-existence studies of DC\_3\_n77 and DC\_8\_n77, own Rx impact of the 3rd band is the followings.

* the 4th order IMD generated by dual uplink of band 3 and band n77 may also impact the own Rx of band 8.
* the 3rd order IMD generated by dual uplink of band 8 and band n77 may also impact the own Rx of band 3.

The new MSDs are specified in below table.

**Table 5.57.3-1: MSD test points for Scell due to dual uplink operation for PC2 EN-DC in NR FR1 (three bands)**

| **NR or E-UTRA Band / Channel bandwidth / NRB / MSD** | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **EN-DC Configuration** | **EUTRA / NR band** | **UL Fc  (MHz)** | **UL/DL BW  (MHz)** | **UL**  **LCRB** | **DL Fc (MHz)** | **MSD  (dB)** | **IMD order** |
| DC\_3A-8A\_n77A | 3 | 1715 | 5 | 25 | 1810 | N/A | N/A |
| DC\_3C-8A\_n77A | n77 | 4190 | 10 | 50 | 4190 | N/A | N/A |
| DC\_3A-8A\_n77(2A) | 8 | 910 | 5 | 25 | 955 | 21.2 | IMD4 |
| DC\_3C-8A\_n77(2A) | 8 | 910 | 5 | 25 | 955 | N/A | N/A |
|  | n77 | 3640 | 10 | 50 | 3640 | N/A | N/A |
|  | 3 | 1725 | 5 | 25 | 1820 | 24.8 | IMD3 |

5.57.4 ∆TIB and ∆RIB values

There is no change by comparing to the values for PC3 DC.

5.58 DC\_8\_n77

5.58.1 Configuration for DC

When requested EN-DC configuration is 2DL2UL, it is not needed to update the inter-band EN-DC configuration table. By referring to the maximum output power table, it can be checked whether these configurations support PC2. This band combination for PC3 is already specified in TS 38.101-3, so this section is omitted.

5.58.2 Maximum output power for DC

**Table 5.58.2-1:** **Maximum output power for inter-band EN-DC (two bands)**

| **EN-DC configuration** | **Power class 2**  **(dBm)** | **Tolerance**  **(dB)** | **Power class 3**  **(dBm)** | **Tolerance**  **(dB)** |
| --- | --- | --- | --- | --- |
| DC\_8A\_n77A | 266 | +2/-3 | 23 | +2/-3 |
| NOTE 6: The UE supports PC3 within E-UTRA cell group, and supports either PC3 or PC2 within NR cell group. Power class support within each individual cell group is signaled separately by the UE. | | | | |

5.58.3 REFSENS requirements for DC

Analysis of REFSENS exceptions or MSD requirements is needed due to higher power UL DC.

* The 4th order harmonic of band 8 fall into Rx frequencies of n77, but band 8 can only support PC3 so no need to introduce PC2 MSD due to harmonic.
* The 4th harmonic mixing falls into Rx frequencies of band 8, but it is not defined for PC3 due to even order is not mandatory to be defined so same applies for PC2
* The 4th order IMD fall into Rx frequencies of band 8.
* No cross band isolation interference.

New PC2 MSDs are defined in the following tables.

Note: The Uplink configuration for reference sensitivity exception table is omitted here which is the same as for PC3.

**Table 5.58.3-1:** **MSD test points for PCell due to dual uplink operation for PC2 EN-DC in NR FR1 (two bands)**

| **NR or E-UTRA Band / Channel bandwidth / NRB / MSD** | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **EN-DC**  **Configuration** | **EUTRA or NR band** | **UL Fc  (MHz)** | **UL/DL BW  (MHz)** | **UL  LCRB** | **DL Fc (MHz)** | **MSD  (dB)** | **IMD order** |
| DC\_8A\_n77A | 8 | 897.5 | 5 | 25 | 942.5 | 15.5 | IMD4 |
| n77 | 3635 | 10 | 50 | 3635 | N/A | N/A |

5.58.4 ∆TIB and ∆RIB values

There is no change by comparing to the values for PC3 DC.

5.59 DC\_3\_n28-n77

5.59.1 Configuration for DC

**Table 5.59.1-1: Inter-band EN-DC configurations within FR1 (three bands)**

| **EN-DC**  **configuration** | **Uplink EN-DC**  **configuration**  **(NOTE 1)** |
| --- | --- |
| DC\_3A\_n28A-n77A5,14 | DC\_3A\_n77A14 |
| NOTE 1: Uplink EN-DC configurations are the configurations supported by the present release of specifications.  NOTE 5: Applicable for UE supporting inter-band EN-DC with mandatory simultaneous Rx/Tx capability  NOTE 14: PC3 or PC2 Uplink EN-DC configuration is applicable to EN-DC configurations. | |

5.59.2 Maximum output power for DC

Since the maximum output power requirement for PC2 UL DC\_3\_n77 is already specified in the specification, this section can be omitted.

5.59.3 REFSENS requirements for DC

Analysis of REFSENS exceptions or MSD requirements is needed due to higher power UL DC.

* IMD3 of dual UL may fall into Rx frequencies of band n28.

The MSD values for IMD3 reused the value for PC2 CA\_n3-n28-n77 in the specifications.

New PC2 MSDs are defined in the following tables.

**Table 5.59.3-1:** **MSD test points for PCell due to dual uplink operation for PC2 EN-DC in NR FR1 (two bands)**

| **NR or E-UTRA Band / Channel bandwidth / NRB / MSD** | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **EN-DC**  **Configuration** | **EUTRA or NR band** | **UL Fc  (MHz)** | **UL/DL BW  (MHz)** | **UL  LCRB** | **DL Fc (MHz)** | **MSD  (dB)** | **IMD order** |
| DC\_3A\_n28A-n77A | 3 | 1712.5 | 5 | 25 | 1807.5 | N/A | N/A |
| n28 | 715 | 5 | 25 | 770 | 24.2 | IMD3 |
| n77 | 4195 | 10 | 50 | 4195 | N/A | N/A |

5.59.4 ∆TIB and ∆RIB values

There is no change by comparing to the values for PC3 DC.

5.60 DC\_18\_n28-n77

5.60.1 Configuration for DC

**Table 5.60.1-1: Inter-band EN-DC configurations within FR1 (three bands)**

| **EN-DC**  **configuration** | **Uplink EN-DC**  **configuration**  **(NOTE 1)** |
| --- | --- |
| DC\_18A\_n28A-n77A5,14 | DC\_18A\_n77A14 |
| NOTE 1: Uplink EN-DC configurations are the configurations supported by the present release of specifications.  NOTE 5: Applicable for UE supporting inter-band EN-DC with mandatory simultaneous Rx/Tx capability  NOTE 14: PC3 or PC2 Uplink EN-DC configuration is applicable to EN-DC configurations. | |

5.60.2 Maximum output power for DC

Since the maximum output power requirements for PC2 UL DC\_18\_n77 is proposed in R4-230xxxx in this meeting, this section can be omitted.

5.60.3 REFSENS requirements for DC

Analysis of REFSENS exceptions or MSD requirements is needed due to higher power UL DC.

* IMD5 of dual UL may fall into Rx frequencies of band n28.

New PC2 MSD is defined in the following tables.

**Table 5.60.3-1:** **MSD test points for PCell due to dual uplink operation for PC2 EN-DC in NR FR1 (two bands)**

| **NR or E-UTRA Band / Channel bandwidth / NRB / MSD** | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **EN-DC**  **Configuration** | **EUTRA or NR band** | **UL Fc  (MHz)** | **UL/DL BW  (MHz)** | **UL  LCRB** | **DL Fc (MHz)** | **MSD  (dB)** | **IMD order** |
| DC\_18A\_n28A-n77A | 18 | 820 | 5 | 25 | 865 | N/A | N/A |
| n28 | 723 | 5 | 25 | 778 | 17.5 | IMD5 |
| n77 | 4058 | 10 | 50 | 4058 | N/A | N/A |

5.60.4 ∆TIB and ∆RIB values

5.61 DC\_18\_n41

5.61.1 Configuration for DC

When requested EN-DC configuration is 2DL2UL, it is not needed to update the inter-band EN-DC configuration table. By referring to the maximum output power table, it can be checked whether these configurations support PC2. This band combination for PC3 is already specified in TS 38.101-3, so this section is omitted.

5.61.2 Maximum output power for DC

**Table 5.61.2-1:** **Maximum output power for inter-band EN-DC (two bands)**

| **EN-DC configuration** | **Power class 2**  **(dBm)** | **Tolerance**  **(dB)** | **Power class 3**  **(dBm)** | **Tolerance**  **(dB)** |
| --- | --- | --- | --- | --- |
| DC\_18A\_n41A | 266 | +2/-3 | 23 | +2/-3 |
| NOTE 6: The UE supports PC3 within E-UTRA cell group, and supports either PC3 or PC2 within NR cell group. Power class support within each individual cell group is signalled separately by the UE. | | | | |

5.61.3 REFSENS requirements for DC

Analysis of REFSENS exceptions or MSD requirements is needed due to higher power UL DC.

* No new harmonic issue since band 18 can only transmit PC3.
* the 3rd order harmonic mixing may fall into Rx frequencies of band 18.
* IMD3 of dual UL may fall into Rx frequencies of band 18.
* No cross band isolation interference.

There is no IMD defined for PC3, so same principle applies for PC2.

MSD due to harmonic mixing is defined as below.

New PC2 MSD is defined in the following tables.

**Table 5.3.3-1:** **Reference sensitivity exceptions (MSD) due to receiver harmonic mixing for PC2 EN-DC in NR FR1**

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **E-UTRA or 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)** | **40 MHz**  **(dB)** | **50 MHz**  **(dB)** | **60 MHz**  **(dB)** | **80 MHz**  **(dB)** | **90 MHz**  **(dB)** | **100 MHz**  **(dB)** |
| n41 | 18X | 27.3 | 27.3 | 25.5 |  |  |  |  |  |  |  |  |
| NOTE X: No requirements apply for the case that there is at least one individual RE within the uplink transmission bandwidth of the relative higher band and when the frequency range of relative higher band’s uplink channel bandwidth or uplink 1st adjacent channel bandwidth is fully or partially overlapped with the 3 times of the frequency range of the relative lower band’s downlink channel bandwidth. The reference sensitivity is only verified when this is not the case. | | | | | | | | | | | | |

5.61.4 ∆TIB and ∆RIB values

There is no change by comparing to the values for PC3 DC.

5.62 DC\_18\_n77

5.62.1 Configuration for DC

When requested EN-DC configuration is 2DL2UL, it is not needed to update the inter-band EN-DC configuration table. By referring to the maximum output power table, it can be checked whether these configurations support PC2. This band combination for PC3 is already specified in TS 38.101-3, so this section is omitted.

5.62.2 Maximum output power for DC

**Table 5.62.2-1:** **Maximum output power for inter-band EN-DC (two bands)**

| **EN-DC configuration** | **Power class 2**  **(dBm)** | **Tolerance**  **(dB)** | **Power class 3**  **(dBm)** | **Tolerance**  **(dB)** |
| --- | --- | --- | --- | --- |
| DC\_18A\_n77A | 266 | +2/-3 | 23 | +2/-3 |
| NOTE 6: The UE supports PC3 within E-UTRA cell group, and supports either PC3 or PC2 within NR cell group. Power class support within each individual cell group is signalled separately by the UE. | | | | |

5.62.3 REFSENS requirements for DC

Analysis of REFSENS exceptions or MSD requirements is needed due to higher power UL DC.

* No new harmonic issue since band 18 can only transmit PC3.
* the 4th order harmonic mixing may fall into Rx frequencies of band 18.
* IMD4/5 of dual UL may fall into Rx frequencies of Band 18.
* No cross band isolation interference.

There is the 4th order harmonic mixing, which is not mandatory to be defined according to Rel-16 agreement.

Similar with PC3 CA\_n18-n77 and DC\_18\_n77, as clarified by note 8 in table 7.3A.5-1, there is no need to define exact values for IMD4/5.

New PC2 MSDs are defined in the following tables.

**Table 5.62.3-1:** **MSD test points for PCell due to dual uplink operation for PC2 EN-DC in NR FR1 (two bands)**

| **NR or E-UTRA Band / Channel bandwidth / NRB / MSD** | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **EN-DC**  **Configuration** | **EUTRA or NR band** | **UL Fc  (MHz)** | **UL/DL BW  (MHz)** | **UL  LCRB** | **DL Fc (MHz)** | **MSD  (dB)** | **IMD order** |
| DC\_18A\_n77AX | 18 | N/A | N/A | N/A | N/A | N/A | IMD4/5 |
|  | n77 | N/A | N/A | N/A | N/A | N/A | N/A |
| NOTE X: There is no IMD4/5 products in band n18 downlink for n77 operating in 3520 – 3560 MHz, 3700 – 3800MHz and 4000 - 4100MHz frequency range. | | | | | | | |

5.62.4 ∆TIB and ∆RIB values

There is no change by comparing to the values for PC3 DC.

5.63 DC\_41\_n28-n77

5.63.1 Configuration for DC

**Table 5.63.1-1: Inter-band EN-DC configurations within FR1 (three bands)**

| **EN-DC**  **configuration** | **Uplink EN-DC**  **configuration**  **(NOTE 1)** |
| --- | --- |
| DC\_41A\_n28A-n77A14 | DC\_41A\_n77A14 |
| NOTE 1: Uplink EN-DC configurations are the configurations supported by the present release of specifications.  NOTE 14: PC3 or PC2 Uplink EN-DC configuration is applicable to EN-DC configurations. | |

5.63.2 Maximum output power for DC

Since the maximum output power requirement for PC2 UL DC\_41\_n77 is already specified in the specification, this section can be omitted.

5.63.3 REFSENS requirements for DC

Analysis of REFSENS exceptions or MSD requirements is needed due to higher power UL DC.

* IMD2/3/5 of dual UL may fall into Rx frequencies of band n28.

The MSD values for IMD2 reused the value for PC2 CA\_n28-n41-n77 in the specifications.

New PC2 MSDs are defined in the following tables.

**Table 5.63.3-1:** **MSD test points for PCell due to dual uplink operation for PC2 EN-DC in NR FR1 (two bands)**

| **NR or E-UTRA Band / Channel bandwidth / NRB / MSD** | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **EN-DC**  **Configuration** | **EUTRA or NR band** | **UL Fc  (MHz)** | **UL/DL BW  (MHz)** | **UL  LCRB** | **DL Fc (MHz)** | **MSD  (dB)** | **IMD order** |
| DC\_41A\_n28A-n77A | n28 | 743 | 5 | 25 | 798 | 36.8 | IMD21,X |
| 41 | 2642 | 5 | 25 | 2642 | N/A | N/A |
| n77 | 3440 | 10 | 50 | 3440 | N/A | N/A |
| NOTE 1: This band is subject to IMD5 also which MSD is not specified.  NOTE X: This band is subject to IMD3 also which MSD is not specified. | | | | | | | |

5.63.4 ∆TIB and ∆RIB values

There is no change by comparing to the values for PC3 DC.

### 5.64 DC\_2\_n78

#### 5.64.1 Configurations for DC

Table 5.5B.4.1-1: Inter-band EN-DC configurations within FR1 (two bands)

| **EN-DC**  **configuration** | **Uplink EN-DC**  **configuration**  **(NOTE 1)** | **Single UL allowed** | **DL interruption allowed**  **(Note 14)** |
| --- | --- | --- | --- |
| DC\_2A\_n78A | DC\_2A\_n78A | DC\_2\_n78 |  |
| DC\_2A\_n78(2A)21 | DC\_2A\_n78A21 | DC\_2\_n78 |  | |
| NOTE 21: For this DC configuration, reference sensitivity exceptions for Power Class 2, if allowed, are specified in Clause 7.3B.2.3. If the uplink EN-DC configuration supported in Table 6.2B.1.3-1 is applicable to the same EN-DC configuration, the note is not shown as the reference sensitivity exceptions, if any, have been confirmed. | | | | |

#### 5.64.2 Maximum output power for DC

**Table 5.64.2-1:** **Maximum output power for inter-band EN-DC (two bands)**

| EN-DC configuration | Power class 2  (dBm) | Tolerance  (dB) | Power class 3  (dBm) | Tolerance  (dB) |
| --- | --- | --- | --- | --- |
| DC\_2A\_n78A | 266,8 | +2/-3 | 23 | +2/-3 |
| NOTE 6: The UE supports PC3 within E-UTRA cell group, and supports either PC3 or PC2 within NR cell group. Power class support within each individual cell group is signaled separately by the UE.  NOTE 8: The UE that supports PC3 within a TDD or FDD band and supports PC2 within a second TDD band may signal a [HigherPowerLimitCADC] capability whereby the maximum output power indicated in the table may be exceeded in accordance with sub-clause 6.2B.4.1.3. | | | | |

#### 5.64.3 REFSENS requirements for DC

**Table 5.64.3.2-1: Impact of UL/DL Harmonic**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | | **2nd Harmonic** | | **3rd Harmonic** | | **4th Harmonic** | | **5th Harmonic** | | **6th Harmonic** | | **7th Harmonic** | |
|  | **UL Low Band Edge** | **UL High Band Edge** | **UL Low Band Edge** | **UL High Band Edge** | **UL Low Band Edge** | **UL High Band Edge** | **UL Low Band Edge** | **UL High Band Edge** | **UL Low Band Edge** | **UL High Band Edge** | **UL Low Band Edge** | **UL High Band Edge** | **UL Low Band Edge** | **UL High Band Edge** |
| 2 | 1850 | 1910 | 3700 | 3820 | 5550 | 5730 | 7400 | 7640 | 9250 | 9550 | 11100 | 11460 | 12950 | 13370 |
| n78 | 3300 | 3800 | 6600 | 7600 | 9900 | 11400 | 13200 | 15200 | 16500 | 19000 | 19800 | 22800 | 23100 | 26600 |

Table 5.64.3.2-1 lists up to 7th harmonics for 2\_n78 which shows that there are 2nd harmonics issues from UL 2 into DL n78. MSD is defined for PC3 and is not needed to PC2 (since band 2 is not HPUE).

Table 5.64.3.2-2 Harmonic mixing for 2DLs/1UL

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  | **2nd Harmonic** | | **3rd Harmonic** | | **4th Harmonic** | |
| **Band** | **UL Low Band Edge** | UL High Band Edge | DL Low Band Edge | DL High Band Edge | DL Low Band Edge | DL High Band Edge | DL Low Band Edge | DL High Band Edge | DL Low Band Edge | DL High Band Edge |
| 2 | 1850 | 1910 | 1930 | 1990 | 3860 | 3980 | 5790 | 5970 | 7720 | 7960 |
| n78 | 3300 | 3800 | 3300 | 3800 | 6600 | 7600 | 9900 | 11400 | 13200 | 15200 |

Table 5.64.3.2-2 list harmonic mixing issue for the 2DL bands DC. As can be seen there are no harmonic mixing issues.

Co-existence studies for DC\_2\_n78 shows that the 2nd, 4th, and 5th order IMD might fall into Rx frequencies of band 2. PC2 MSD values is reused from CA\_n2-n77.

Table 5.64.3.2-3: MSD test points for PCell due to dual uplink operation for PC2 EN-DC in NR FR1 (two bands)

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Band / Channel bandwidth / NRB / Duplex mode | | | | | | | | Source of IMD |
| EN-DC  Configuration | EUTRA or NR band | UL Fc  (MHz) | UL/DL BW  (MHz) | UL  CLRB | DL Fc (MHz) | MSD  (dB) | Duplex mode |  |
| DC\_2A\_n78A DC\_2A\_n78(2A) | 2 | 1855 | 5 | 25 | 1935 | 32.10 | FDD | IMD2 |
|  | n78 | 3790 | 10 | 50 | 3790 | N/A | TDD | N/A |
|  | 2 | 1900 | 5 | 25 | 1980 | 19.10 | FDD | IMD4 |
|  | n78 | 3720 | 10 | 50 | 3720 | N/A | TDD | N/A |

#### 5.64.4 ∆TIB and ∆RIB values

There is no change by comparing to the values for PC3 DC, so this section is omitted.

### 5.65 DC\_5\_n78

#### 5.65.1 Configurations for DC

Table 5.5B.4.1-1: Inter-band EN-DC configurations within FR1 (two bands)

| **EN-DC**  **configuration** | **Uplink EN-DC**  **configuration**  **(NOTE 1)** | **Single UL allowed** | **DL interruption allowed**  **(Note 14)** |
| --- | --- | --- | --- |
| DC\_5A\_n78A  DC\_5A\_n78(2A) 21 | DC\_5A\_n78A21 |  |  |
| NOTE 21: For this DC configuration, reference sensitivity exceptions for Power Class 2, if allowed, are specified in Clause 7.3B.2.3. If the uplink EN-DC configuration supported in Table 6.2B.1.3-1 is applicable to the same EN-DC configuration, the note is not shown as the reference sensitivity exceptions, if any, have been confirmed. | | | |

#### 5.65.2 Maximum output power for DC

**Table 5.65.2-1:** **Maximum output power for inter-band EN-DC (two bands)**

| EN-DC configuration | Power class 2  (dBm) | Tolerance  (dB) | Power class 3  (dBm) | Tolerance  (dB) |
| --- | --- | --- | --- | --- |
| DC\_5A\_n78A | 266,8 | +2/-3 | 23 | +2/-3 |
| NOTE 6: The UE supports PC3 within E-UTRA cell group, and supports either PC3 or PC2 within NR cell group. Power class support within each individual cell group is signaled separately by the UE.  NOTE 8: The UE that supports PC3 within a TDD or FDD band and supports PC2 within a second TDD band may signal a [HigherPowerLimitCADC] capability whereby the maximum output power indicated in the table may be exceeded in accordance with sub-clause 6.2B.4.1.3. | | | | |

#### 5.65.3 REFSENS requirements for DC

**Table 5.65.3.2-1: Impact of UL/DL Harmonic**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | | **2nd Harmonic** | | **3rd Harmonic** | | **4th Harmonic** | | **5th Harmonic** | | **6th Harmonic** | | **7th Harmonic** | |
|  | **UL Low Band Edge** | **UL High Band Edge** | **UL Low Band Edge** | **UL High Band Edge** | **UL Low Band Edge** | **UL High Band Edge** | **UL Low Band Edge** | **UL High Band Edge** | **UL Low Band Edge** | **UL High Band Edge** | **UL Low Band Edge** | **UL High Band Edge** | **UL Low Band Edge** | **UL High Band Edge** |
| 5 | 824 | 849 | 1648 | 1698 | 2472 | 2547 | 3296 | 3396 | 4120 | 4245 | 4944 | 5094 | 5768 | 5943 |
| n78 | 3300 | 3800 | 6600 | 7600 | 9900 | 11400 | 13200 | 15200 | 16500 | 19000 | 19800 | 22800 | 23100 | 26600 |

Table 5.65.3.2-1 lists up to 7th harmonics for 5\_n78 which shows that there are 3rd harmonics issues from UL 5 into DL n78. MSD is defined for PC3 and is not needed to PC2 (since band 5 is not HPUE).

Table 5.65.3.2-2 Harmonic mixing for 2DLs/1UL

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  | **2nd Harmonic** | | **3rd Harmonic** | | **4th Harmonic** | |
| **Band** | **UL Low Band Edge** | UL High Band Edge | DL Low Band Edge | DL High Band Edge | DL Low Band Edge | DL High Band Edge | DL Low Band Edge | DL High Band Edge | DL Low Band Edge | DL High Band Edge |
| 5 | 824 | 849 | 869 | 894 | 1738 | 1788 | 2607 | 2682 | 3476 | 3576 |
| n78 | 3300 | 3800 | 3300 | 3800 | 6600 | 7600 | 9900 | 11400 | 13200 | 15200 |

Table 5.65.3.2-2 list harmonic mixing issue for the 2DL bands DC. As can be seen there are 4th harmonic mixing issues from DL 5 into UL n78. MSD is defined for PC3 and is needed for PC2. MSD values are derive from CA\_n5-n77.

Table 5.65.3.2-3: Reference sensitivity exceptions (MSD) due to receiver harmonic mixing for PC2 EN-DC in NR FR1

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **UL band** | **DL band** | **UL BW** | **SCS of UL band** | **UL RB Allocation** | **DL BW** | **MSD** | **UL/DL fc condition** | **UL/DL harmonic order** |
| **(MHz)** | **(kHz)** | **LCRB** | **(MHz)** | **(dB)** |
| n78 | 5 | 10 | 15 | 25 (RBstart=0) | 5 | 8.1 | NOTE 5 | UL1/DL4 |
| NOTE 5: The requirements should be verified for UL NR-ARFCN of the aggressor (higher) band (superscript HB) such that  in MHz and  with  the carrier frequency in the victim (lower) band and  the channel bandwidth configured in the higher band | | | | | | | | |

Co-existence studies for DC\_5\_n78 shows that the 4th order IMD might fall into Rx frequencies of band 5. PC2 MSD values is reused from CA\_n5-n78.

Table 5.65.3.2-4: MSD test points for PCell due to dual uplink operation for PC2 EN-DC in NR FR1 (two bands)

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Band / Channel bandwidth / NRB / Duplex mode | | | | | | | | Source of IMD |
| EN-DC  Configuration | EUTRA or NR band | UL Fc  (MHz) | UL/DL BW  (MHz) | UL  CLRB | DL Fc (MHz) | MSD  (dB) | Duplex mode |  |
| DC\_5A\_n78A | 5 | 844 | 5 | 25 | 889 | 18.6 | FDD | IMD4 |
|  | n78 | 3421 | 10 | 50 | 3421 | N/A | TDD | N/A |

#### 5.65.4 ∆TIB and ∆RIB values

There is no change by comparing to the values for PC3 DC, so this section is omitted.

### 5.66 DC\_13\_n78

#### 5.66.1 Configurations for DC

Table 5.5B.4.1-1: Inter-band EN-DC configurations within FR1 (two bands)

| **EN-DC**  **configuration** | **Uplink EN-DC**  **configuration**  **(NOTE 1)** | **Single UL allowed** | **DL interruption allowed**  **(Note 14)** |
| --- | --- | --- | --- |
| DC\_13A\_n78A DC\_13A\_n78(2A)21 | DC\_13A\_n78A21 |  |  |
| NOTE 21: For this DC configuration, reference sensitivity exceptions for Power Class 2, if allowed, are specified in Clause 7.3B.2.3. If the uplink EN-DC configuration supported in Table 6.2B.1.3-1 is applicable to the same EN-DC configuration, the note is not shown as the reference sensitivity exceptions, if any, have been confirmed. | | | |

#### 5.66.2 Maximum output power for DC

**Table 5.66.2-1:** **Maximum output power for inter-band EN-DC (two bands)**

| EN-DC configuration | Power class 2  (dBm) | Tolerance  (dB) | Power class 3  (dBm) | Tolerance  (dB) |
| --- | --- | --- | --- | --- |
| DC\_13A\_n78A | 266,8 | +2/-3 | 23 | +2/-3 |
| NOTE 6: The UE supports PC3 within E-UTRA cell group, and supports either PC3 or PC2 within NR cell group. Power class support within each individual cell group is signaled separately by the UE.  NOTE 8: The UE that supports PC3 within a TDD or FDD band and supports PC2 within a second TDD band may signal a [HigherPowerLimitCADC] capability whereby the maximum output power indicated in the table may be exceeded in accordance with sub-clause 6.2B.4.1.3. | | | | |

#### 5.66.3 REFSENS requirements for DC

**Table 5.66.3.2-1: Impact of UL/DL Harmonic**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | | **2nd Harmonic** | | **3rd Harmonic** | | **4th Harmonic** | | **5th Harmonic** | | **6th Harmonic** | | **7th Harmonic** | |
|  | **UL Low Band Edge** | **UL High Band Edge** | **UL Low Band Edge** | **UL High Band Edge** | **UL Low Band Edge** | **UL High Band Edge** | **UL Low Band Edge** | **UL High Band Edge** | **UL Low Band Edge** | **UL High Band Edge** | **UL Low Band Edge** | **UL High Band Edge** | **UL Low Band Edge** | **UL High Band Edge** |
| 13 | 777 | 787 | 1554 | 1574 | 2331 | 2361 | 3108 | 3148 | 3885 | 3935 | 4662 | 4722 | 5439 | 5509 |
| n78 | 3300 | 3800 | 6600 | 7600 | 9900 | 11400 | 13200 | 15200 | 16500 | 19000 | 19800 | 22800 | 23100 | 26600 |

Table 5.66.3.2-1 lists up to 7th harmonics for 13\_n78 which shows that there are no harmonics issues.

Table 5.66.3.2-2 Harmonic mixing for 2DLs/1UL

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  | **2nd Harmonic** | | **3rd Harmonic** | | **4th Harmonic** | | **5th Harmonic** | |
| **Band** | **UL Low Band Edge** | UL High Band Edge | DL Low Band Edge | DL High Band Edge | DL Low Band Edge | DL High Band Edge | DL Low Band Edge | DL High Band Edge | DL Low Band Edge | DL High Band Edge | DL Low Band Edge | DL High Band Edge |
| 13 | 777 | 787 | 746 | 756 | 1492 | 1512 | 2238 | 2268 | 2984 | 3024 | 3730 | 3780 |
| n78 | 3300 | 3800 | 3300 | 3800 | 6600 | 7600 | 9900 | 11400 | 13200 | 15200 | 16500 | 19000 |

Table 5.66.3.2-2 list harmonic mixing issue for the 2DL bands DC. As can be seen there are 5th order harmonic mixing issues.

Table 5.66.3.2-3: Reference sensitivity exceptions (MSD) due to receiver harmonic mixing for PC2 EN-DC in NR FR1

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **UL band** | **DL band** | **UL BW** | **SCS of UL band** | **UL RB Allocation** | **DL BW** | **MSD** | **UL/DL fc condition** | **UL/DL harmonic order** |
| **(MHz)** | **(kHz)** | **LCRB** | **(MHz)** | **(dB)** |
| n78 | 13 | 10 | 15 | 25 (RBstart=0) | 5 | 34 | NOTE 1 | UL1/DL5 |
| NOTE 1: The requirements should be verified for DL NR-ARFCN of the victim (lower) band (superscript LB) such that  with  the DL carrier frequency in the lower band and the UL carrier frequency in the higher band, both in MHz | | | | | | | | |

Co-existence studies for DC\_13\_n78 shows that there are no IMD issues.

#### 5.66.4 ∆TIB and ∆RIB values

There is no change by comparing to the values for PC3 DC, so this section is omitted.

### 5.67 DC\_66\_n78

#### 5.67.1 Configurations for DC

Table 5.5B.4.1-1: Inter-band EN-DC configurations within FR1 (two bands)

| **EN-DC**  **configuration** | **Uplink EN-DC**  **configuration**  **(NOTE 1)** | **Single UL allowed** | **DL interruption allowed**  **(Note 14)** |
| --- | --- | --- | --- |
| DC\_66A\_n78A | DC\_66A\_n78A | No |  |
| DC\_66A\_n78(2A)21 DC\_66A-66A\_n78A21 DC\_66A-66A\_n78(2A)21 | DC\_66A\_n78A | No |  | |
| NOTE 21: For this DC configuration, reference sensitivity exceptions for Power Class 2, if allowed, are specified in Clause 7.3B.2.3. If the uplink EN-DC configuration supported in Table 6.2B.1.3-1 is applicable to the same EN-DC configuration, the note is not shown as the reference sensitivity exceptions, if any, have been confirmed. | | | | |

#### 5.67.2 Maximum output power for DC

**Table 5.67.2-1:** **Maximum output power for inter-band EN-DC (two bands)**

| EN-DC configuration | Power class 2  (dBm) | Tolerance  (dB) | Power class 3  (dBm) | Tolerance  (dB) |
| --- | --- | --- | --- | --- |
| DC\_66A\_n78A | 266,8 | +2/-3 | 23 | +2/-3 |
| NOTE 6: The UE supports PC3 within E-UTRA cell group, and supports either PC3 or PC2 within NR cell group. Power class support within each individual cell group is signaled separately by the UE.  NOTE 8: The UE that supports PC3 within a TDD or FDD band and supports PC2 within a second TDD band may signal a [HigherPowerLimitCADC] capability whereby the maximum output power indicated in the table may be exceeded in accordance with sub-clause 6.2B.4.1.3. | | | | |

#### 5.67.3 REFSENS requirements for DC

**Table 5.67.3.2-1: Impact of UL/DL Harmonic**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | | **2nd Harmonic** | | **3rd Harmonic** | | **4th Harmonic** | | **5th Harmonic** | | **6th Harmonic** | | **7th Harmonic** | |
|  | **UL Low Band Edge** | **UL High Band Edge** | **UL Low Band Edge** | **UL High Band Edge** | **UL Low Band Edge** | **UL High Band Edge** | **UL Low Band Edge** | **UL High Band Edge** | **UL Low Band Edge** | **UL High Band Edge** | **UL Low Band Edge** | **UL High Band Edge** | **UL Low Band Edge** | **UL High Band Edge** |
| 66 | 1710 | 1780 | 3420 | 3560 | 5130 | 5340 | 6840 | 7120 | 8550 | 8900 | 10260 | 10680 | 11970 | 12460 |
| n78 | 3300 | 3800 | 6600 | 7600 | 9900 | 11400 | 13200 | 15200 | 16500 | 19000 | 19800 | 22800 | 23100 | 26600 |

Table 5.67.3.2-1 lists up to 7th harmonics for 2\_n78 which shows that there are 2nd harmonics issues from UL 66 into DL n78. MSD is defined for PC3 and is not needed to PC2 (since band 66 is not HPUE).

Table 5.67.3.2-2 Harmonic mixing for 2DLs/1UL

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  | **2nd Harmonic** | | **3rd Harmonic** | | **4th Harmonic** | |
| **Band** | **UL Low Band Edge** | UL High Band Edge | DL Low Band Edge | DL High Band Edge | DL Low Band Edge | DL High Band Edge | DL Low Band Edge | DL High Band Edge | DL Low Band Edge | DL High Band Edge |
| 66 | 1710 | 1780 | 2110 | 2200 | 4220 | 4400 | 6330 | 6600 | 8440 | 8800 |
| n78 | 3300 | 3800 | 3300 | 3800 | 6600 | 7600 | 9900 | 11400 | 13200 | 15200 |

Table 5.67.3.2-2 list harmonic mixing issue for the 2DL bands DC. As can be seen there are no harmonic mixing issues.

Co-existence studies for DC\_66\_n78 shows that the 5th order IMD might fall into Rx frequencies of band 66. PC2 MSD values is reused from CA\_n66-n77.

Table 5.67.3.2-3: MSD test points for PCell due to dual uplink operation for PC2 EN-DC in NR FR1 (two bands)

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Band / Channel bandwidth / NRB / Duplex mode | | | | | | | | Source of IMD |
| EN-DC  Configuration | EUTRA or NR band | UL Fc  (MHz) | UL/DL BW  (MHz) | UL  CLRB | DL Fc (MHz) | MSD  (dB) | Duplex mode |  |
| DC\_66A\_n78A | 66 | 1760 | 5 | 25 | 2160 | 11.27 | FDD | IMD5 |
|  | n77 | 3720 | 10 | 50 | 3720 | N/A | TDD | N/A |

#### 5.67.4 ∆TIB and ∆RIB values

There is no change by comparing to the values for PC3 DC, so this section is omitted.

### 5.68 DC\_71\_n78

#### 5.68.1 Configurations for DC

Table 5.5B.4.1-1: Inter-band EN-DC configurations within FR1 (two bands)

| **EN-DC**  **configuration** | **Uplink EN-DC**  **configuration**  **(NOTE 1)** | **Single UL allowed** | **DL interruption allowed**  **(Note 14)** |
| --- | --- | --- | --- |
| DC\_71A\_n78A DC\_71A\_n78(2A)21 | DC\_71A\_n78A21 |  |  |
| NOTE 21: For this DC configuration, reference sensitivity exceptions for Power Class 2, if allowed, are specified in Clause 7.3B.2.3. If the uplink EN-DC configuration supported in Table 6.2B.1.3-1 is applicable to the same EN-DC configuration, the note is not shown as the reference sensitivity exceptions, if any, have been confirmed. | | | |

#### 5.68.2 Maximum output power for DC

**Table 5.68.2-1:** **Maximum output power for inter-band EN-DC (two bands)**

| EN-DC configuration | Power class 2  (dBm) | Tolerance  (dB) | Power class 3  (dBm) | Tolerance  (dB) |
| --- | --- | --- | --- | --- |
| DC\_71A\_n78A | 266,8 | +2/-3 | 23 | +2/-3 |
| NOTE 6: The UE supports PC3 within E-UTRA cell group, and supports either PC3 or PC2 within NR cell group. Power class support within each individual cell group is signaled separately by the UE.  NOTE 8: The UE that supports PC3 within a TDD or FDD band and supports PC2 within a second TDD band may signal a [HigherPowerLimitCADC] capability whereby the maximum output power indicated in the table may be exceeded in accordance with sub-clause 6.2B.4.1.3. | | | | |

#### 5.68.3 REFSENS requirements for DC

**Table 5.68.3.2-1: Impact of UL/DL Harmonic**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | | **2nd Harmonic** | | **3rd Harmonic** | | **4th Harmonic** | | **5th Harmonic** | | **6th Harmonic** | | **7th Harmonic** | |
|  | **UL Low Band Edge** | **UL High Band Edge** | **UL Low Band Edge** | **UL High Band Edge** | **UL Low Band Edge** | **UL High Band Edge** | **UL Low Band Edge** | **UL High Band Edge** | **UL Low Band Edge** | **UL High Band Edge** | **UL Low Band Edge** | **UL High Band Edge** | **UL Low Band Edge** | **UL High Band Edge** |
| 71 | 663 | 698 | 1326 | 1396 | 1989 | 2094 | 2652 | 2792 | 3315 | 3490 | 3978 | 4188 | 4641 | 4886 |
| n78 | 3300 | 3800 | 6600 | 7600 | 9900 | 11400 | 13200 | 15200 | 16500 | 19000 | 19800 | 22800 | 23100 | 26600 |

Table 5.68.3.2-1 lists up to 7th harmonics for 71\_n78 which shows that there are 5th harmonics issues from 71 UL into n78 DL MSD is defined for PC3 and is not needed to PC2 (since band 71 is not HPUE).

Table 5.68.3.2-2 Harmonic mixing for 2DLs/1UL

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  | **2nd Harmonic** | | **3rd Harmonic** | | **4th Harmonic** | |
| **Band** | **UL Low Band Edge** | UL High Band Edge | DL Low Band Edge | DL High Band Edge | DL Low Band Edge | DL High Band Edge | DL Low Band Edge | DL High Band Edge | DL Low Band Edge | DL High Band Edge |
| 71 | 663 | 698 | 617 | 652 | 1234 | 1304 | 1851 | 1956 | 2468 | 2608 |
| n78 | 3300 | 3800 | 3300 | 3800 | 6600 | 7600 | 9900 | 11400 | 13200 | 15200 |

Table 5.68.3.2-2 list harmonic mixing issue for the 2DL bands DC. As can be seen there are no harmonic mixing issues.

Co-existence studies for DC\_71\_n78 shows that the 5th order IMD might fall into Rx frequencies of band 71. PC2 MSD values is reused from DC\_71A\_n77A.

Table 5.68.3.2-3: MSD test points for PCell due to dual uplink operation for PC2 EN-DC in NR FR1 (two bands)

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Band / Channel bandwidth / NRB / Duplex mode | | | | | | | | Source of IMD |
| EN-DC  Configuration | EUTRA or NR band | UL Fc  (MHz) | UL/DL BW  (MHz) | UL  CLRB | DL Fc (MHz) | MSD  (dB) | Duplex mode |  |
| DC\_71A\_n78A DC\_71A\_n78(2A) | 71 | 681.5 | 5 | 25 | 635.5 | 11.4 | FDD | IMD5 |
|  | n78 | 3361.5 | 10 | 50 | 3361.5 | N/A | TDD | N/A |

#### 5.68.4 ∆TIB and ∆RIB values

There is no change by comparing to the values for PC3 DC, so this section is omitted.

### 5.69 DC\_2-7\_n78

#### 5.69.1 Configuration for DC

Table 5.69.1-1: Inter-band EN-DC configurations within FR1 (three bands)

| **EN-DC**  **configuration** | **Uplink EN-DC**  **configuration**  **(NOTE 1)** |
| --- | --- |
| DC\_2A-7A\_n78A5,14  DC\_2A-7A\_n78(2A) 5,14  DC\_2A-7A-7A\_n78A5,14  DC\_2A-7A-7A\_n78(2A) 5,14  DC\_2A-7C\_n78A5,14  DC\_2A-7C\_n78(2A) 5,14 | DC\_2A\_n78A14  DC\_7A\_n78A14 |
| NOTE 1: Uplink EN-DC configurations are the configurations supported by the present release of specifications.  NOTE 5: Applicable for UE supporting inter-band EN-DC with mandatory simultaneous Rx/Tx capability  NOTE 14: PC3 or PC2 Uplink EN-DC configuration is applicable to EN-DC configurations. | |

#### 5.69.2 Maximum output power for DC

Based on studies of PC2 DC\_2\_n78 and PC2 DC\_7\_n78, this section can be omitted.

#### 5.69.3 REFSENS requirements for DC

Coexistence studies show that UL 2\_n78 does not give IMD into band 7 DL.

Coexistence studies show that UL 7\_n78 give 4th order IMD into band 2 DL.

MSD value for band 2 is derived from PC2 MSD values for CA\_n25-n41-n77.

Table 5.69.3-1: MSD test points for Scell due to dual uplink operation for EN-DC in NR FR1 (three bands)

| NR or E-UTRA Band / Channel bandwidth / NRB / MSD | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- |
| EN-DC Configuration | EUTRA / NR band | UL Fc  (MHz) | UL/DL BW  (MHz) | UL  LCRB | DL Fc (MHz) | MSD  (dB) | IMD order |
| DC\_2A-7A\_n78A | 2 | 1870 | 5 | 25 | 1950 | 20.0 | IMD4 |
|  | 7 | 2550 | 5 | 25 | 2685 | N/A | N/A |
|  | n78 | 3525 | 10 | 50 | 3525 | N/A | N/A |

#### 5.69.4 ∆TIB and ∆RIB values

There is no change to the values for PC3, so this section is omitted.

### 5.70 DC\_2-66\_n78

#### 5.70.1 Configuration for DC

Table 5.70.1-1: Inter-band EN-DC configurations within FR1 (three bands)

| **EN-DC**  **configuration** | **Uplink EN-DC**  **configuration**  **(NOTE 1)** |
| --- | --- |
| DC\_2A-66A\_n78A5,14  DC\_2A-66A\_n78(2A) 5,14  DC\_2A-66A-66A\_n78A5,14  DC\_2A-66A-66A\_n78(2A) 5,14 | DC\_2A\_n78A14  DC\_66A\_n78A14 |
| NOTE 1: Uplink EN-DC configurations are the configurations supported by the present release of specifications.  NOTE 5: Applicable for UE supporting inter-band EN-DC with mandatory simultaneous Rx/Tx capability  NOTE 14: PC3 or PC2 Uplink EN-DC configuration is applicable to EN-DC configurations. | |

#### 5.70.2 Maximum output power for DC

Based on studies of PC2 DC\_2\_n78 and PC2 DC\_66\_n78, this section can be omitted.

#### 5.70.3 REFSENS requirements for DC

Coexistence studies show that UL 2\_n78 give 4th order IMD into band 66 DL.

Coexistence studies show that UL 66\_n78 give 2nd, 4th and 5th order IMD into band 2 DL.

MSD value for IMD5 band 2 is derived from CA\_n25-n66-n77, and all other MSD values are derived from DC\_2A-66A\_n77A.

Table 5.70.3-1: MSD test points for Scell due to dual uplink operation for EN-DC in NR FR1 (three bands)

| NR or E-UTRA Band / Channel bandwidth / NRB / MSD | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- |
| EN-DC Configuration | EUTRA / NR band | UL Fc  (MHz) | UL/DL BW  (MHz) | UL  LCRB | DL Fc (MHz) | MSD  (dB) | IMD order |
| DC\_2A-66A\_n78A | 2 | 1880 | 5 | 25 | 1960 | M/A | N/A |
|  | 66 | 1740 | 5 | 25 | 2140 | 21.1 | IMD4 |
|  | n78 | 3500 | 5 | 25 | 3500 | N/A | N/A |
|  | 2 | 1880 | 5 | 25 | 1960 | 37.6 | IMD2 |
|  | 66 | 1760 | 5 | 25 | 2160 | N/A | N/A |
|  | n78 | 3720 | 5 | 25 | 3720 | N/A | N/A |
|  | 2 | 1860 | 5 | 25 | 1940 | 19.8 | IMD4 |
|  | 66 | 1775 | 5 | 25 | 2195 | N/A | N/A |
|  | n78 | 3385 | 5 | 25 | 3385 | N/A | N/A |
|  | 2 | 1880 | 5 | 25 | 1960 | 13.2 | IMD5 |
|  | 66 | 1760 | 5 | 25 | 2160 | N/A | N/A |
|  | n78 | 3620 | 10 | 50 | 3620 | N/A | N/A |

#### 5.70.4 ∆TIB and ∆RIB values

There is no change to the values for PC3, so this section is omitted.

### 5.71 DC\_7-66\_n78

#### 5.71.1 Configuration for DC

Table 5.71.1-1: Inter-band EN-DC configurations within FR1 (three bands)

| **EN-DC**  **configuration** | **Uplink EN-DC**  **configuration**  **(NOTE 1)** |
| --- | --- |
| DC\_7A-66A\_n78A5,14  DC\_7A-66A\_n78(2A) 5,14  DC\_7A-7A-66A\_n78A5,14  DC\_7A-7A-66A\_n78(2A) 5,14  DC\_7C-66A\_n78A5,14  DC\_7C-66A\_n78(2A) 5,14  DC\_7A-66A-66A\_n78A5,14  DC\_7A-66A-66A\_n78(2A) 5,14  DC\_7C-66A-66A\_n78A5,14  DC\_7C-66A-66A\_n78(2A) 5,14 | DC\_7A\_n78A14  DC\_66A\_n78A14 |
| NOTE 1: Uplink EN-DC configurations are the configurations supported by the present release of specifications.  NOTE 5: Applicable for UE supporting inter-band EN-DC with mandatory simultaneous Rx/Tx capability  NOTE 14: PC3 or PC2 Uplink EN-DC configuration is applicable to EN-DC configurations. | |

#### 5.71.2 Maximum output power for DC

Based on studies of PC2 DC\_7\_n78 and PC2 DC\_66\_n78, this section can be omitted.

#### 5.71.3 REFSENS requirements for DC

Coexistence studies show that UL 7\_n78 give 4th order IMD into band 66 DL.

Coexistence studies show that UL 66\_n78 does not give IMD into band 7 DL.

MSD value for band 66 is derived from PC2 MSD values for CA\_n41-n66-n77.

Table 5.71.3-1: MSD test points for Scell due to dual uplink operation for EN-DC in NR FR1 (three bands)

| NR or E-UTRA Band / Channel bandwidth / NRB / MSD | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- |
| EN-DC Configuration | EUTRA / NR band | UL Fc  (MHz) | UL/DL BW  (MHz) | UL  LCRB | DL Fc (MHz) | MSD  (dB) | IMD order |
| DC\_7A-66A\_n78A | 7 | 2540 | 5 | 25 | 2660 | N/A | N/A |
|  | 66 | 1760 | 5 | 25 | 2160 | 20.5 | IMD4 |
|  | n78 | 3620 | 10 | 50 | 3620 | N/A | N/A |

#### 5.71.4 ∆TIB and ∆RIB values

There is no change to the values for PC3, so this section is omitted.

### 5.72 DC\_8\_n1-n78

#### 5.72.1 Configuration for DC

Table 5.72.1-1: Inter-band EN-DC configurations within FR1 (three bands)

| **EN-DC**  **Configuration** | **Uplink EN-DC**  **configuration**  **(NOTE 1)** |
| --- | --- |
| DC\_8A\_n1A-n78A5, **14** | DC\_8A\_n1A  DC\_8A\_n78A**14** |
| NOTE 14: PC3 or PC2 Uplink EN-DC configuration is applicable to EN-DC configurations. | |

Note that the note 5 already existed in the specification for these combinations.

#### 5.72.2 Maximum output power for DC

Since the maximum output power requirement for PC2 UL DC\_8A\_n78A is already specified in the specification, this section can be omitted.

#### 5.72.3 REFSENS requirements for DC

Based on co-existence studies of DC\_8\_n78 captured in TR 37.863-01-01, own Rx impacts of the 3rd band are as follows:

* The IMD generated by dual uplink of band 8 and band n78 will not impact the Rx frequencies of band n1.

#### 5.72.4 ∆TIB and ∆RIB values

There is no change by comparing to the values for PC3 DC, so this section is omitted.

### 5.73 DC\_8\_n1-n77

#### 5.73.1 Configuration for DC

**Table 5.73.1-1: Inter-band EN-DC configurations within FR1 (three bands)**

| **EN-DC**  **configuration** | **Uplink EN-DC**  **configuration**  **(NOTE 1)** |
| --- | --- |
| **DC\_8A\_n1A-n77A5, 14** | DC\_8A\_n1A  **DC\_8A\_n77A14** |
| NOTE1: Uplink EN-DC configurations are the configurations supported by the present release of specifications.  NOTE 5: Applicable for UE supporting inter-band EN-DC with mandatory simultaneous Rx/Tx capability  NOTE 14: PC3 or PC2 Uplink EN-DC configuration is applicable to EN-DC configurations. | |

#### 5.73.2 Maximum output power for DC

The maximum output power requirement for PC2 UL DC\_8\_n77 is already specified in Table 6.2B.1.3-1 in TS38.101-3[3]. So, this section can be omitted.

#### 5.73.3 REFSENS requirements for DC

Analysis of REFSENS exceptions or MSD requirements is needed due to higher power UL DC. Based on co-existence studies of DC\_8\_n1-n77 could be reused from DC\_1-8\_n77 captured to 5.55.3 in TR38.898[5], own Rx impacts of the 3rd band are as follows:

* 3rd order IMD generated by dual uplink of band 8 and band n77 may fall into Rx of band n1.

Table 5.73.3-1: MSD test points for SCell due to dual uplink operation for PC2 EN-DC in NR FR1 (three bands)

| **NR or E-UTRA Band / Channel bandwidth / NRB / MSD** | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **EN-DC Configuration** | **EUTRA / NR band** | **UL Fc  (MHz)** | **UL/DL BW  (MHz)** | **UL**  **LCRB** | **DL Fc (MHz)** | **MSD  (dB)** | **IMD order** |
| DC\_8A\_n1A-n77A | 8 | 910 | 5 | 25 | 955 | N/A | N/A |
|  | n77 | 3960 | 10 | 50 | 3960 | N/A | N/A |
|  | n1 | N/A | 5 | N/A | 2140 | 27.5 | IMD3 |

#### 5.73.4 ∆TIB and ∆RIB values

There is no change by comparing to the values for PC3 DC.

### 5.74 DC\_8\_n3-n77

#### 5.74.1 Configuration for DC

**Table 5.74.1-1: Inter-band EN-DC configurations within FR1 (three bands)**

| **EN-DC**  **configuration** | **Uplink EN-DC**  **configuration**  **(NOTE 1)** |
| --- | --- |
| **DC\_8A\_n3A-n77A5, 14** | DC\_8A\_n1A  **DC\_8A\_n77A14** |
| NOTE1: Uplink EN-DC configurations are the configurations supported by the present release of specifications.  NOTE 5: Applicable for UE supporting inter-band EN-DC with mandatory simultaneous Rx/Tx capability  NOTE 14: PC3 or PC2 Uplink EN-DC configuration is applicable to EN-DC configurations. | |

#### 5.74.2 Maximum output power for DC

The maximum output power requirement for PC2 UL DC\_8\_n77 is already specified in Table 6.2B.1.3-1 of TS38.101-3[3]. So, this section can be omitted.

#### 5.74.3 REFSENS requirements for DC

Analysis of REFSENS exceptions or MSD requirements is needed due to higher power UL DC. Based on co-existence studies of DC\_8\_n3-n77 could be reused from DC\_3-8\_n77 captured to 5.57.3 in TR38.898[5], own Rx impacts of the 3rd band are as follows:

- 3rd order IMD generated by dual uplink of band 8 and band n77 may also impact the own Rx of band 3.

Table 5.74.3-1: MSD test points for SCell due to dual uplink operation for PC2 EN-DC in NR FR1 (three bands)

| **NR or E-UTRA Band / Channel bandwidth / NRB / MSD** | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **EN-DC Configuration** | **EUTRA / NR band** | **UL Fc  (MHz)** | **UL/DL BW  (MHz)** | **UL**  **LCRB** | **DL Fc (MHz)** | **MSD  (dB)** | **IMD order** |
| DC\_8A\_n3A-n77A | 8 | 910 | 5 | 25 | 955 | N/A | N/A |
|  | n77 | 3640 | 10 | 50 | 3640 | N/A | N/A |
|  | n3 | N/A | 5 | N/A | 1820 | 24.5 | IMD3 |

#### 5.74.4 ∆TIB and ∆RIB values

There is no change by comparing to the values for PC3 DC.

### 5.75 DC\_8\_n28-n77

#### 5.75.1 Configuration for DC

**Table 5.75.1-1: Inter-band EN-DC configurations within FR1 (three bands)**

| **EN-DC**  **configuration** | **Uplink EN-DC**  **configuration**  **(NOTE 1)** |
| --- | --- |
| **DC\_8A\_n28A-n77A5,14** | DC\_8A\_n28A  **DC\_8A\_n77A14** |
| NOTE1: Uplink EN-DC configurations are the configurations supported by the present release of specifications.  NOTE 5: Applicable for UE supporting inter-band EN-DC with mandatory simultaneous Rx/Tx capability  NOTE 14: PC3 or PC2 Uplink EN-DC configuration is applicable to EN-DC configurations. | |

#### 5.75.2 Maximum output power for DC

The maximum output power requirement for PC2 UL DC\_8\_n77 is already specified in Table 6.2B.1.3-1 of TS38.101-3[3]. So, this section can be omitted.

#### 5.75.3 REFSENS requirements for DC

Analysis of REFSENS exceptions or MSD requirements is needed due to higher power UL DC. Based on co-existence studies of DC\_8\_n77 captured in TR 37.863-01-01[7], own Rx impacts of the 3rd band are as follows:

* the 4th order IMD generated by dual uplink of band 8 and band n77 may fall into Rx frequencies of band n28.

Table 5.75.3-1: MSD test points for SCell due to dual uplink operation for PC2 EN-DC in NR FR1 (three bands)

| **NR or E-UTRA Band / Channel bandwidth / NRB / MSD** | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **EN-DC Configuration** | **EUTRA / NR band** | **UL Fc  (MHz)** | **UL/DL BW  (MHz)** | **UL**  **LCRB** | **DL Fc (MHz)** | **MSD  (dB)** | **IMD order** |
| DC\_8A\_n28A-n77A | 8 | 910 | 5 | 25 | 955 | N/A | N/A |
|  | n28 | N/A | 5 | N/A | 765 | 23 | IMD4 |
|  | n77 | 3495 | 10 | 50 | 3495 | N/A | N/A |

#### 5.75.4 ∆TIB and ∆RIB values

There is no change by comparing to the values for PC3 DC.

### 5.76 DC\_3\_n41-n77

#### 5.76.1 Configuration for DC

**Table 5.76.1-1: Inter-band EN-DC configurations within FR1 (three bands)**

| **EN-DC**  **configuration** | **Uplink EN-DC**  **configuration**  **(NOTE 1)** |
| --- | --- |
| DC\_3A\_n41A-n77A14 | DC\_3A\_n41A14  DC\_3A\_n77A14 |
| NOTE 1: Uplink EN-DC configurations are the configurations supported by the present release of specifications.  NOTE 14: Minimum requirements for PC2 are applicable for this uplink EN-DC configuration in this downlink/uplink EN-DC configuration. | |

#### 5.76.2 Maximum output power for DC

Since the maximum output power requirement for PC2 UL DC\_3\_n41 and DC\_3\_n77 are already specified in the specification, this section can be omitted.

#### 5.76.3 REFSENS requirements for DC

Analysis of REFSENS exceptions or MSD requirements is needed due to higher power UL DC.

* IMD3/5 of dual UL DC\_3A\_n41A may fall into Rx frequencies of band n77.
* IMD5 of dual UL DC\_3A\_n77A may fall into Rx frequencies of band n41.

The MSD values reused the values for PC2 CA\_n3-n41-n77 in the specifications.

New PC2 MSDs are defined in the following tables.

**Table 5.76.3-1:** **MSD test points for PCell due to dual uplink operation for PC2 EN-DC in NR FR1 (two bands)**

| **NR or E-UTRA Band / Channel bandwidth / NRB / MSD** | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **EN-DC**  **Configuration** | **EUTRA or NR band** | **UL Fc  (MHz)** | **UL/DL BW  (MHz)** | **UL  LCRB** | **DL Fc (MHz)** | **MSD  (dB)** | **IMD order** |
| DC\_3A\_n41A-n77A | n3 | 1720 | 5 | 25 | **1815** | N/A | N/A |
| n41 | 2580 | 5 | 25 | **2580** | N/A | N/A |
| n77 | N/A | 10 | N/A | **3440** | **25.6** | **IMD31** |
|  | n3 | 1720 | 5 | 25 | **1815** | N/A | N/A |
|  | n41 | N/A | 5 | N/A | **2640** | **13** | **IMD5** |
|  | n77 | 3900 | 10 | 50 | **3900** | N/A | N/A |
| NOTE 1: This band is subject to IMD5 also which MSD is not specified. | | | | | | | |

#### 5.76.4 ∆TIB and ∆RIB values

There is no change by comparing to the values for PC3 DC.

### 5.77 DC\_3-28\_n41

#### 5.77.1 Configuration for DC

**Table 5.77.1-1: Inter-band EN-DC configurations within FR1 (three bands)**

| **EN-DC**  **configuration** | **Uplink EN-DC**  **configuration**  **(NOTE 1)** |
| --- | --- |
| DC\_3A-28A\_n41A5,14 | DC\_3A\_n41A14  DC\_28A\_n41A14 |
| NOTE 1: Uplink EN-DC configurations are the configurations supported by the present release of specifications.  NOTE 5: Applicable for UE supporting inter-band EN-DC with mandatory simultaneous Rx/Tx capability  NOTE 14: Minimum requirements for PC2 are applicable for this uplink EN-DC configuration in this downlink/uplink EN-DC configuration. | |

#### 5.77.2 Maximum output power for DC

Since the maximum output power requirement for PC2 UL DC\_3\_n41 and DC\_28\_n41 are already specified in the specification, this section can be omitted.

#### 5.77.3 REFSENS requirements for DC

Analysis of REFSENS exceptions or MSD requirements is needed due to higher power UL DC.

* IMD2/3 of dual UL DC\_3A\_n41A may fall into Rx frequencies of band n28.
* IMD2 of dual UL DC\_28A\_n41A may fall into Rx frequencies of band n3.

The MSD values reused the values for PC2 CA\_n3-n28-n41 in the specifications.

New PC2 MSDs are defined in the following tables.

**Table 5.77.3-1:** **MSD test points for PCell due to dual uplink operation for PC2 EN-DC in NR FR1 (two bands)**

| **NR or E-UTRA Band / Channel bandwidth / NRB / MSD** | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **EN-DC**  **Configuration** | **EUTRA or NR band** | **UL Fc  (MHz)** | **UL/DL BW  (MHz)** | **UL  LCRB** | **DL Fc (MHz)** | **MSD  (dB)** | **IMD order** |
| DC\_3A-28A\_n41A | 3 | 1720 | 5 | 25 | 1815 | N/A | N/A |
| n41 | 2510 | 5 | 25 | 2510 | N/A | N/A |
| 28 | N/A | 5 | N/A | 790 | 32 | IMD211 |
|  | 3 | N/A | 5 | N/A | 1832.5 | 32 | IMD2 |
|  | n41 | 2543 | 10 | 50 | 2543 | N/A | N/A |
|  | 28 | 710.5 | 5 | 25 | 765.5 | N/A | N/A |
| NOTE 11: This band is subject to IMD3 also which MSD is not specified | | | | | | | |

#### 5.77.4 ∆TIB and ∆RIB values

There is no change by comparing to the values for PC3 DC.

### 5.78 DC\_3-28\_n77

#### 5.78.1 Configuration for DC

**Table 5.78.1-1: Inter-band EN-DC configurations within FR1 (three bands)**

| **EN-DC**  **configuration** | **Uplink EN-DC**  **configuration**  **(NOTE 1)** |
| --- | --- |
| DC\_3A-28A\_n77A5,14 | DC\_3A\_n77A14  DC\_28A\_n77A14 |
| NOTE 1: Uplink EN-DC configurations are the configurations supported by the present release of specifications.  NOTE 5: Applicable for UE supporting inter-band EN-DC with mandatory simultaneous Rx/Tx capability  NOTE 14: Minimum requirements for PC2 are applicable for this uplink EN-DC configuration in this downlink/uplink EN-DC configuration. | |

#### 5.78.2 Maximum output power for DC

Since the maximum output power requirement for PC2 UL DC\_3\_n77 and DC\_28\_n77 are already specified in the specification, this section can be omitted.

#### 5.78.3 REFSENS requirements for DC

Analysis of REFSENS exceptions or MSD requirements is needed due to higher power UL DC.

* IMD3 of dual UL DC\_3A\_n77A may fall into Rx frequencies of band n28.
* IMD3/4 of dual UL DC\_28A\_n77A may fall into Rx frequencies of band n3.

The MSD values reused the values for PC2 CA\_n3-n28-n77 in the specifications.

New PC2 MSDs are defined in the following tables.

**Table 5.78.3-1:** **MSD test points for PCell due to dual uplink operation for PC2 EN-DC in NR FR1 (two bands)**

| **NR or E-UTRA Band / Channel bandwidth / NRB / MSD** | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **EN-DC**  **Configuration** | **EUTRA or NR band** | **UL Fc  (MHz)** | **UL/DL BW  (MHz)** | **UL  LCRB** | **DL Fc (MHz)** | **MSD  (dB)** | **IMD order** |
| DC\_3A-28A\_n77A | 3 | 1712.5 | 5 | 25 | 1807.5 | N/A | N/A |
| 28 | N/A | 5 | N/A | 770 | 24.2 | IMD3 |
| n77 | 4195 | 10 | 50 | 4195 | N/A | N/A |
|  | 3 | N/A | 5 | N/A | 1850 | 25.8 | IMD35 |
|  | 28 | 735 | 5 | 25 | 790 | N/A | N/A |
|  | n77 | 3320 | 10 | 50 | 3320 | N/A | N/A |
| NOTE 5: This band is subject to IMD4 also which MSD is not specified. | | | | | | | |

#### 5.78.4 ∆TIB and ∆RIB values

There is no change by comparing to the values for PC3 DC.

# Annex A - Change history

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Date** | **Meeting** | **TDoc** | **Subject/Comment** | **New version** |
| 2022-11 | 3GPP RAN4#105 | R4-2218950 | Initial version  Implemented TP’s from RAN4 #105:  R4-2220466, TP for PC2 DC\_1\_n79 for TR 38.898, DoCoMo  R4-2220467, TP for PC2 DC\_3\_n79 for TR 38.898, DoCoMo  R4-2220468, TP for PC2 DC\_19\_n79 for TR 38.898, DoCoMo  R4-2220469, TP for PC2 DC\_21\_n79 for TR 38.898, DoCoMo | 0.1.0 |
| 2023-03 | 3GPP RAN4#106 | R4-2301062 | Implemented TP’s from RAN4 #106:  R4-2301302, TP for PC2 DC\_1\_n77-n79 for TR 38.898, NTT DOCOMO, INC.  R4-2301303, TP for PC2 DC\_3\_n77-n79 for TR 38.898, NTT DOCOMO, INC.  R4-2301304, TP for PC2 DC\_21\_n77-n79 for TR 38.898, NTT DOCOMO, INC.  R4-2301305, TP for PC2 DC\_1\_n78-n79 for TR 38.898, NTT DOCOMO, INC.  R4-2301306, TP for PC2 DC\_3\_n78-n79 for TR 38.898, NTT DOCOMO, INC.  R4-2301307, TP for PC2 DC\_21\_n78-n79 for TR 38.898, NTT DOCOMO, INC.  R4-2301309, TP for PC2 DC\_1-21\_n77 for TR 38.898, NTT DOCOMO, INC.  R4-2301310, TP for PC2 DC\_1-42\_n77 for TR 38.898, NTT DOCOMO, INC.  R4-2301311, TP for PC2 DC\_3-21\_n77 for TR 38.898, NTT DOCOMO, INC.  R4-2301312, TP for PC2 DC\_3-42\_n77 for TR 38.898, NTT DOCOMO, INC.  R4-2301313, TP for PC2 DC\_21-42\_n77 for TR 38.898, NTT DOCOMO, INC.  R4-2303446, TP for PC2 DC\_1\_n77 for TR 38.898, NTT DOCOMO, INC.  R4-2303447, TP for PC2 DC\_3\_n77 for TR 38.898, NTT DOCOMO, INC.  R4-2303448, TP for PC2 DC\_21\_n77 for TR 38.898, NTT DOCOMO, INC.  R4-2303449, TP for PC2 DC\_21\_n78 for TR 38.898, NTT DOCOMO, INC.  R4-2303450, TP for PC2 DC\_1-3\_n77 for TR 38.898, NTT DOCOMO, INC. | 0.2.0 |
| 2023-04 | 3GPP RAN4#106bis-e | R4-2304858 | Implemented TP’s from RAN4 #106bis-e:  R4-2306534, TP for TR 38.898: DC\_1A\_n41A, Samsung, KDDI, Qualcomm  R4-2306535, TP for TR 38.898 DC\_41A\_n77A, Samsung, KDDI, Qualcomm  R4-2305617, TP for PC2 DC\_1-3\_n78 for TR 38.898, NTT DOCOMO, INC.  R4-2305618, TP for PC2 DC\_1-42\_n78 for TR 38.898, NTT DOCOMO, INC.  R4-2305619, TP for PC2 DC\_3-42\_n78 for TR 38.898, NTT DOCOMO, INC.  R4-2305620, TP for PC2 DC\_21-42\_n78 for TR 38.898, NTT DOCOMO, INC.  R4-2305621, TP for PC2 DC\_1-3\_n79 for TR 38.898, NTT DOCOMO, INC.  R4-2305622, TP for PC2 DC\_1-19\_n79 for TR 38.898, NTT DOCOMO, INC.  R4-2305623, TP for PC2 DC\_1-21\_n79 for TR 38.898, NTT DOCOMO, INC.  R4-2305624, TP for PC2 DC\_1-42\_n79 for TR 38.898, NTT DOCOMO, INC.  R4-2305625, TP for PC2 DC\_3-19\_n79 for TR 38.898, NTT DOCOMO, INC.  R4-2305626, TP for PC2 DC\_3-21\_n79 for TR 38.898, NTT DOCOMO, INC.  R4-2306537, TP for PC2 DC\_3-42\_n79 for TR 38.898, NTT DOCOMO, INC.  R4-2305628, TP for PC2 DC\_19-21\_n79 for TR 38.898, NTT DOCOMO, INC.  R4-2305629, TP for PC2 DC\_19-42\_n79 for TR 38.898, NTT DOCOMO, INC.  R4-2305630, TP for PC2 DC\_21-42\_n79 for TR 38.898, NTT DOCOMO, INC. | 0.3.0 |
| 2023-05 | 3GPP RAN4#107 | R4-2309388 | Implemented TP’s from RAN4 #107:  R4-2308141, TP for TR 38.898 HPUE DC\_28A\_n41A, Samsung, KDDI  R4-2308142, TP for TR 38.898 HPUE DC\_28A\_n77A, Samsung, KDDI  R4-2309332, TP for PC2 DC\_19\_n77 for TR 38.898, NTT DOCOMO, INC., Qualcomm Inc., MediaTek Inc.  R4-2309333, TP for PC2 DC\_19\_n78 for TR 38.898, NTT DOCOMO, INC., Qualcomm Inc., MediaTek Inc.  R4-2309334, TP for PC2 DC\_1-19\_n77 for TR 38.898, NTT DOCOMO, INC., Qualcomm Inc., MediaTek Inc.  R4-2309335, TP for PC2 DC\_1-19\_n78 for TR 38.898, NTT DOCOMO, INC., Qualcomm Inc., MediaTek Inc.  R4-2309336, TP for PC2 DC\_3-19\_n77 for TR 38.898, NTT DOCOMO, INC., Qualcomm Inc., MediaTek Inc.  R4-2309337, TP for PC2 DC\_3-19\_n78 for TR 38.898, NTT DOCOMO, INC., Qualcomm Inc., MediaTek Inc.  R4-2309338, TP for PC2 DC\_19-21\_n77 for TR 38.898, NTT DOCOMO, INC.  R4-2309339, TP for PC2 DC\_19-21\_n78 for TR 38.898, NTT DOCOMO, INC.  R4-2309340, TP for PC2 DC\_19-42\_n77 for TR 38.898, NTT DOCOMO, INC.  R4-2309341, TP for PC2 DC\_19-42\_n78 for TR 38.898, NTT DOCOMO, INC.  R4-2309342, TP for PC2 DC\_19\_n77-n79 for TR 38.898, NTT DOCOMO, INC.  R4-2309343, TP for PC2 DC\_19\_n78-n79 for TR 38.898, NTT DOCOMO, INC.  R4-2309344, TP for PC2 DC\_1-21\_n78 for TR 38.898, NTT DOCOMO, INC., Qualcomm Inc., MediaTek Inc.  R4-2309345, TP for PC2 DC\_3-21\_n78 for TR 38.898, NTT DOCOMO, INC., Qualcomm Inc., MediaTek Inc.  R4-2310240, TP for TR 38.898: PC2 support for DC\_3A\_n1A-n78A, DC\_3A-3A\_n1A-n78A, DC\_7A\_n1A-n78A, DC\_7A-7A\_n1A-n78A, CHTTL | 0.4.0 |
| 2023-08 | 3GPP RAN4#108 | R4-2311107 | Implemented TP’s from RAN4 #108:  [R4-2311943](file:///D:\RAN4%23108\Docs\R4-2311943.zip), TP for TR 38.898 HPUE DC\_1-8\_n77, Samsung, KT corporation, Qualcomm  [R4-2311944](file:///D:\RAN4%23108\Docs\R4-2311944.zip), TP for TR 38.898 HPUE DC\_1-8\_n78, Samsung, KT corporation, Qualcomm  [R4-2314627](file:///D:\RAN4%23108\Docs\R4-2314627.zip), TP for TR 38.898 HPUE DC\_3-8\_n77, Samsung, KT corporation, Qualcomm  [R4-2314702](file:///D:\RAN4%23108\Docs\R4-2314702.zip), TP for TR 38.898 HPUE DC\_8A\_n77A, Samsung, KT corporation, Qualcomm  [R4-2311968](file:///D:\RAN4%23108\Docs\R4-2311968.zip), TP for TR 38.898 HPUE DC\_3A\_n28A-n77A, Samsung, KDDI  [R4-2311969](file:///D:\RAN4%23108\Docs\R4-2311969.zip). TP for TR 38.898 HPUE DC\_18A\_n28A-n77A, Samsung, KDDI, Qualcomm  [R4-2314628](file:///D:\RAN4%23108\Docs\R4-2314628.zip), TP for TR 38.898 HPUE DC\_18A\_n41A, Samsung, KDDI, Qualcomm  [R4-2311971](file:///D:\RAN4%23108\Docs\R4-2311971.zip), TP for TR 38.898 HPUE DC\_18A\_n77A, Samsung, KDDI, Qualcomm  [R4-2314629](file:///D:\RAN4%23108\Docs\R4-2314629.zip), TP for TR 38.898 HPUE DC\_41A\_n28A-n77A, Samsung, KDDI  [R4-2314630](file:///D:\RAN4%23108\Docs\R4-2314630.zip), TP for TR 38.898 adding PC2 DC\_2\_n78, Ericsson, Bell Mobility  [R4-2314631](file:///D:\RAN4%23108\Docs\R4-2314631.zip), TP for TR 38.898 adding PC2 DC\_5\_n78, Ericsson, Bell Mobility  [R4-2314632](file:///D:\RAN4%23108\Docs\R4-2314632.zip), TP for TR 38.898 adding PC2 DC\_13\_n78, Ericsson, Bell Mobility  [R4-2313323](file:///D:\RAN4%23108\Docs\R4-2313323.zip), TP for PC2 DC\_66\_n78 for TR 38.898, Ericsson, Bell Mobility  [R4-2314633](file:///D:\RAN4%23108\Docs\R4-2314633.zip), TP for TR 38.898 adding PC2 DC\_71\_n78, Ericsson, Bell Mobility  [R4-2313332](file:///D:\RAN4%23108\Docs\R4-2313332.zip), TP for TR 38.898 adding PC2 DC\_2-7\_n78, Ericsson, Bell Mobility  [R4-2314634](file:///D:\RAN4%23108\Docs\R4-2314634.zip), TP for TR 38.898 adding PC2 DC\_2-66\_n78, Ericsson, Bell Mobility  [R4-2313334](file:///D:\RAN4%23108\Docs\R4-2313334.zip), TP for TR 38.898 adding PC2 DC\_7-66\_n78, Ericsson, Bell Mobility  [R4-2313642](file:///D:\RAN4%23108\Docs\R4-2313642.zip), TP for TR 38.898: UL PC2 support for DC\_8A\_n1A-n78A, CHTTL | 0.5.0 |
| 2023-10 | 3GPP RAN4#108-bis | R4-2316414 | No TP’s approved RAN4#108-bis | 0.6.0 |
| 2023-11 | 3GPP RAN4#109 | R4-2320306 | Implemented TP’s from RAN4 #109:  [R4-2321702](file:///D:\\RAN4%23109\\Docs\\R4-2321702.zip), TP for TR38.898 PC2 ENDC for FR1 2BLTE1BNR and 1BLTE2BNR, SoftBank Corp., LG Electronics  [R4-2319773](file:///D:\\RAN4%23109\\Docs\\R4-2319773.zip), TP for TR 38.898 HPUE DC\_3\_n41-n77. Samsung, KDDI, Qualcomm  [R4-2319774](file:///D:\\RAN4%23109\\Docs\\R4-2319774.zip), TP for TR 38.898 HPUE DC\_3-28\_n41, Samsung, KDDI, Qualcomm  [R4-2319775](file:///D:\\RAN4%23109\\Docs\\R4-2319775.zip), TP for TR 38.898 HPUE DC\_3-28\_n77, Samsung, KDDI, Qualcomm | 0.7.0 |