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| 3GPP TR 37.718-21-11 V0.9.0 (2023-11) | |
| Technical Report | |
| 3rd Generation Partnership Project;  Technical Specification Group Radio Access Networks;  Dual Connectivity of 2 bands LTE inter-band CA and 1 NR band (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;

3 or greater indicates TSG approved document under change control.

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

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

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

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

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

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

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

**should** indicates a recommendation to do something

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

**may** indicates permission to do something

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

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

**can** indicates that something is possible

**cannot** indicates that something is impossible

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

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

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

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

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

In addition:

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

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

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

# 1 Scope

The present document is a technical report for Dual Connectivity of 2 bands LTE inter-band CA (2DL/1UL) and 1 NR band (1DL/1UL) under Rel-18 time frame. The purpose is to gather the relevant background information and studies in order to address Dual connectivity (DC) band combinations of 3 different bands DL with 2 different bands UL (2 different LTE bands and 1 NR band) for the Rel-18 band combinations. The actual requirements are added to the corresponding technical specification.

# 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".

…

[x] <doctype> <#>[ ([up to and including]{yyyy[-mm]|V<a[.b[.c]]>}[onwards])]: "<Title>".

# 3 Definitions of terms, symbols and abbreviations

## 3.1 Terms

For the purposes of the present document, the terms given in 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 TR 21.905 [1].

Definition format (Normal)

**<defined term>:** <definition>.

**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 format (EW)

<symbol> <Explanation>

## 3.3 Abbreviations

For the purposes of the present document, the abbreviations given in 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 TR 21.905 [1].

Abbreviation format (EW)

<ABBREVIATION> <Expansion>

# 4 Background

The present document is a technical report for Dual Connectivity (EN-DC) of 2 bands LTE inter-band CA and 1 NR band under 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 DC of 2 bands LTE inter-band CA and 1 NR band within FR1: Specific Band Combination Part

## 5.x DC\_a-b\_nc

### 5.x.1 Configurations for DC

*<Editor’s note: it is required to use the same table format as in TS 38.101-3>*

Table 5.x.1-1: Inter-band DC configurations (three bands)

| **EN-DC**  **configuration** | **Uplink EN-DC**  **configuration** |
| --- | --- |
|  |  |

### 5.x.2 Co-existence studies

*<Text will be added.>*

### 5.x.3 ∆TIB and ∆RIB values

*<Editor’s note: it is required to use the same table format as in TS 38.101-3>*

Table 5.X.3-1: ΔTIB,c

| Inter-band EN-DC configuration | ΔTIB,c for E-UTRA band / NR band (dB)6 | | |
| --- | --- | --- | --- |
| Component band in order of bands in configuration7 | | |
| DC\_a-b\_nc |  |  |  |
| NOTE 6: “-” denotes ΔTIB,c = 0.  NOTE 7: The component band order in the configuration should be listed by the order of E-UTRA band and NR band respectively, such as for DC\_66\_(n)12 the band order from left to right is 12, 66 and n12. | | | |

**Table 5.X.3-2: ΔRIB**

| **Inter-band EN-DC configuration** | ΔRIB,c for E-UTRA band / NR band (dB)7 | | |
| --- | --- | --- | --- |
| Component band in order of bands in configuration8 | | |
| DC\_a-b\_nc |  |  |  |
| NOTE 7: “-” denotes ΔRIB,c = 0.  NOTE 8: The component band order in the configuration should be listed by the order of E-UTRA band and NR band respectively, such as for DC\_5\_(n)12 the band order from left to right is 5, 12 and n12. | | | |

### 5.x.4 Reference sensitivity exceptions

< Editor’s note: text will be added only for reference sensitivity exceptions for intermodulation interference due to dual uplink operation for DC in NR FR1 involving three bands >

## 5.1 DC\_1-(n)7

5.1.1 Operating bands for EN-DC

Table 5.1.1-1: EN-DC Band combinations (three bands)

| EN-DC band | E-UTRA CA band | NR band | Single UL allowed |
| --- | --- | --- | --- |
| 1-(n)7 | CA\_1-7 | n7 | No |

### 5.1.2 Configuration for DC

Table 5.1.2-1: Inter-band EN-DC configurations (three bands)

| EN-DC  Configuration | Uplink EN-DC  configuration  (NOTE 1) | E-UTRA CA configuration | NR band |
| --- | --- | --- | --- |
| DC\_1A-(n)7AA | DC\_1A\_n7A | CA\_1A-7A | n7A |

5.1.3 ∆TIB and ∆RIB values

For DC\_1-(n)7, the ΔTIB,c and ΔRIB,c values are reused from DC\_1\_n7 and are given in the tables below.

**Table 5.1.3-1:ΔTIB,c due to EN-DC (three bands)**

| Inter-band EN-DC configuration | ΔTIB,c for E-UTRA band / NR band (dB)6 | | |
| --- | --- | --- | --- |
| Component band in order of bands in configuration7 | | |
| DC\_1-(n)7 | 0.5 | 0.6 | 0.6 |
| NOTE 6: “-” denotes ΔTIB,c = 0.  NOTE 7: The component band order in the configuration should be listed by the order of E-UTRA band and NR band respectively, such as for DC\_66\_(n)12 the band order from left to right is 12, 66 and n12. | | | |

**Table 5.1.3-2:ΔRIB,c due to EN-DC (three bands)**

| **Inter-band EN-DC configuration** | ΔRIB,c for E-UTRA band / NR band (dB)7 | | |
| --- | --- | --- | --- |
| Component band in order of bands in configuration8 | | |
| DC\_1-(n)7 | - | - | - |
| NOTE 7: “-” denotes ΔRIB,c = 0.  NOTE 8: The component band order in the configuration should be listed by the order of E-UTRA band and NR band respectively, such as for DC\_5\_(n)12 the band order from left to right is 5, 12 and n12. | | | |

5.1.4 REFSENS requirements

There are no IMD impact from UL 1\_7 affecting DL band 1 or band n7.

## 5.2 DC\_3-(n)7

5.2.1 Operating bands for EN-DC

Table 5.2.1-1: EN-DC Band combinations (three bands)

| EN-DC band | E-UTRA CA band | NR band | Single UL allowed |
| --- | --- | --- | --- |
| 3-(n)7 | CA\_3-7 | n7 | No |

### 5.2.2 Configuration for DC

Table 5.2.2-1: Inter-band EN-DC configurations (three bands)

| EN-DC  Configuration | Uplink EN-DC  configuration  (NOTE 1) | E-UTRA CA configuration | NR band |
| --- | --- | --- | --- |
| DC\_3A-(n)7AA | DC\_3A\_n7A | CA\_3A-7A | n7A |
| DC\_3C-(n)7AA | DC\_3A\_n7A | CA\_3C-7A | n7A |

5.2.3 ∆TIB and ∆RIB values

For DC\_3-(n)7, the ΔTIB,c and ΔRIB,c values are reused from DC\_3\_n7 and are given in the tables below.

**Table 5.2.3-1:ΔTIB,c due to EN-DC (three bands)**

| Inter-band EN-DC configuration | ΔTIB,c for E-UTRA band / NR band (dB)6 | | |
| --- | --- | --- | --- |
| Component band in order of bands in configuration7 | | |
| DC\_3-(n)7 | 0.5 | 0.5 | 0.5 |
| NOTE 6: “-” denotes ΔTIB,c = 0.  NOTE 7: The component band order in the configuration should be listed by the order of E-UTRA band and NR band respectively, such as for DC\_66\_(n)12 the band order from left to right is 12, 66 and n12. | | | |

**Table 5.2.3-2:ΔRIB,c due to EN-DC (three bands)**

| **Inter-band EN-DC configuration** | ΔRIB,c for E-UTRA band / NR band (dB)7 | | |
| --- | --- | --- | --- |
| Component band in order of bands in configuration8 | | |
| DC\_3-(n)7 | - | - | - |
| NOTE 7: “-” denotes ΔRIB,c = 0.  NOTE 8: The component band order in the configuration should be listed by the order of E-UTRA band and NR band respectively, such as for DC\_5\_(n)12 the band order from left to right is 5, 12 and n12. | | | |

5.2.4 REFSENS requirements

There are possible IMD4 impact from UL 3\_n7 affecting band 7 MSD values based on Skyworks discussion paper R4-2215523: MSD for DC\_3A\_(n)7AA.

| 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-(n)7AA  DC\_3C-(n)7AA | 3 | 1730 | 5 | 25 | 1825 | N/A | N/A |
|  | 7 | N/A | 5 | N/A | 2647.5 | 6.9 | IMD4 |
|  | n7 | 2535 | 10 | 50 | 2655 | 10.2 | IMD4 |

## 5.3 DC\_28-(n)7

5.3.1 Operating bands for EN-DC

Table 5.3.1-1: EN-DC Band combinations (three bands)

| EN-DC band | E-UTRA CA band | NR band | Single UL allowed |
| --- | --- | --- | --- |
| 28-(n)7 | CA\_28-7 | n7 | No |

### 5.3.2 Configuration for DC

Table 5.3.2-1: Inter-band EN-DC configurations (three bands)

| EN-DC  Configuration | Uplink EN-DC  configuration  (NOTE 1) | E-UTRA CA configuration | NR band |
| --- | --- | --- | --- |
| DC\_28A-(n)7AA | DC\_28A\_n7A | CA\_28A-7A | n7A |

5.3.3 ∆TIB and ∆RIB values

For DC\_28-(n)7, the ΔTIB,c and ΔRIB,c values are reused from DC\_28\_n7 and are given in the tables below.

**Table 5.3.3-1:ΔTIB,c due to EN-DC (three bands)**

| Inter-band EN-DC configuration | ΔTIB,c for E-UTRA band / NR band (dB)6 | | |
| --- | --- | --- | --- |
| Component band in order of bands in configuration7 | | |
| DC\_28-(n)7 | 0.3 | 0.3 | 0.3 |
| NOTE 6: “-” denotes ΔTIB,c = 0.  NOTE 7: The component band order in the configuration should be listed by the order of E-UTRA band and NR band respectively, such as for DC\_66\_(n)12 the band order from left to right is 12, 66 and n12. | | | |

**Table 5.3.3-2:ΔRIB,c due to EN-DC (three bands)**

| **Inter-band EN-DC configuration** | ΔRIB,c for E-UTRA band / NR band (dB)7 | | |
| --- | --- | --- | --- |
| Component band in order of bands in configuration8 | | |
| DC\_28-(n)7 | - | - | - |
| NOTE 7: “-” denotes ΔRIB,c = 0.  NOTE 8: The component band order in the configuration should be listed by the order of E-UTRA band and NR band respectively, such as for DC\_5\_(n)12 the band order from left to right is 5, 12 and n12. | | | |

5.3.4 REFSENS requirements

There are no IMD impact from UL 28\_7 affecting DL band 28 or band n7.

## 5.4 DC\_1-26\_n78

5.4.1 Operating bands for EN-DC

Table 5.4.1-1: EN-DC Band combinations (three bands)

| EN-DC band | E-UTRA CA band | NR band | Single UL allowed |
| --- | --- | --- | --- |
| DC\_1-26\_n78 | CA\_1-26 | n78 | No |

### 5.4.2 Configuration for DC

Table 5.4.2-1: Inter-band EN-DC configurations (three bands)

| EN-DC  Configuration | Uplink EN-DC  configuration  (NOTE 1) | E-UTRA CA configuration | NR band |
| --- | --- | --- | --- |
| DC\_1A-26A\_n78A | DC\_1A\_n78A  DC\_26A\_n78A | CA\_1A-26A | n78A |

5.4.3 ∆TIB and ∆RIB values

For DC\_1-26\_n78, the ΔTIB,c and ΔRIB,c values are reused from DC\_1-5\_n78 and are given in the tables below.

**Table 5.4.3-1:ΔTIB,c due to EN-DC (three bands)**

| Inter-band EN-DC configuration | ΔTIB,c for E-UTRA band / NR band (dB)6 | | |
| --- | --- | --- | --- |
| Component band in order of bands in configuration7 | | |
| DC\_1-26\_n78 | 0.3 | 0.6 | 0.8 |
| NOTE 6: “-” denotes ΔTIB,c = 0.  NOTE 7: The component band order in the configuration should be listed by the order of E-UTRA band and NR band respectively, such as for DC\_66\_(n)12 the band order from left to right is 12, 66 and n12. | | | |

**Table 5.4.3-2:ΔRIB,c due to EN-DC (three bands)**

| **Inter-band EN-DC configuration** | ΔRIB,c for E-UTRA band / NR band (dB)7 | | |
| --- | --- | --- | --- |
| Component band in order of bands in configuration8 | | |
| DC\_1-26\_n78 | 0.2 | 0.2 | 0.5 |
| NOTE 7: “-” denotes ΔRIB,c = 0.  NOTE 8: The component band order in the configuration should be listed by the order of E-UTRA band and NR band respectively, such as for DC\_5\_(n)12 the band order from left to right is 5, 12 and n12. | | | |

5.4.4 REFSENS requirements

There are IMD3 impact from UL 26\_n78 affecting DL band 1.

There are IMD5 impact from UL 1\_n78 affecting DL band 26.

MSD values are reused from DC\_1A-5A\_n78A.

Table 7.3B.2.3.5.2-1: 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-26A\_n78A | 1 | 1932 | 5 | 25 | 2122 | 18.1 | IMD3 |
|  | 26 | 829 | 5 | 25 | 874 | N/A | N/A |
|  | n78 | 3780 | 10 | 50 | 3780 | N/A | N/A |
|  | 1 | 1975 | 5 | 25 | 2165 | N/A | N/A |
|  | 26 | 840 | 5 | 25 | 885 | 3.1 | IMD5 |
|  | n78 | 3405 | 10 | 50 | 3405 | N/A | N/A |

## 5.5 DC\_3-26\_n78

5.5.1 Operating bands for EN-DC

Table 5.5.1-1: EN-DC Band combinations (three bands)

| EN-DC band | E-UTRA CA band | NR band | Single UL allowed |
| --- | --- | --- | --- |
| DC\_3-26\_n78 | CA\_3-26 | n78 | No |

### 5.5.2 Configuration for DC

Table 5.5.2-1: Inter-band EN-DC configurations (three bands)

| EN-DC  Configuration | Uplink EN-DC  configuration  (NOTE 1) | E-UTRA CA configuration | NR band |
| --- | --- | --- | --- |
| DC\_3A-26A\_n78A  DC\_3C-26A\_n78A | DC\_3A\_n78A  DC\_26A\_n78A | CA\_3A-26A | n78A |

5.5.3 ∆TIB and ∆RIB values

For DC\_3-26\_n78, the ΔTIB,c and ΔRIB,c values are reused from DC\_3-5\_n78 and are given in the tables below.

**Table 5.5.3-1:ΔTIB,c due to EN-DC (three bands)**

| Inter-band EN-DC configuration | ΔTIB,c for E-UTRA band / NR band (dB)6 | | |
| --- | --- | --- | --- |
| Component band in order of bands in configuration7 | | |
| DC\_3-26\_n78 | 0.6 | 0.6 | 0.8 |
| NOTE 6: “-” denotes ΔTIB,c = 0.  NOTE 7: The component band order in the configuration should be listed by the order of E-UTRA band and NR band respectively, such as for DC\_66\_(n)12 the band order from left to right is 12, 66 and n12. | | | |

**Table 5.5.3-2:ΔRIB,c due to EN-DC (three bands)**

| **Inter-band EN-DC configuration** | ΔRIB,c for E-UTRA band / NR band (dB)7 | | |
| --- | --- | --- | --- |
| Component band in order of bands in configuration8 | | |
| DC\_3-26\_n78 | 0.2 | 0.2 | 0.5 |
| NOTE 7: “-” denotes ΔRIB,c = 0.  NOTE 8: The component band order in the configuration should be listed by the order of E-UTRA band and NR band respectively, such as for DC\_5\_(n)12 the band order from left to right is 5, 12 and n12. | | | |

5.5.4 REFSENS requirements

There are IMD3 impact from UL 26\_n78 affecting DL band 3. MSD values are reused from DC\_5A\_n3A-n78A.

Table 7.3B.2.3.5.2-1: 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-26A\_n78A  DC\_3C-26A\_n78A | 3 | 1767 | 5 | 25 | 1862 | 15.7 | IMD3 |
|  | 26 | 839 | 5 | 25 | 884 | N/A | N/A |
|  | n78 | 3540 | 10 | 50 | 3540 | N/A | N/A |

## 5.6 DC\_7-26\_n78

5.6.1 Operating bands for EN-DC

Table 5.6.1-1: EN-DC Band combinations (three bands)

| EN-DC band | E-UTRA CA band | NR band | Single UL allowed |
| --- | --- | --- | --- |
| DC\_7-26\_n78 | CA\_7-26 | n78 | No |

### 5.6.2 Configuration for DC

Table 5.6.2-1: Inter-band EN-DC configurations (three bands)

| EN-DC  Configuration | Uplink EN-DC  configuration  (NOTE 1) | E-UTRA CA configuration | NR band |
| --- | --- | --- | --- |
| DC\_7A-26A\_n78A  DC\_7C-26A\_n78A | DC\_7A\_n78A  DC\_26A\_n78A | CA\_7A-26A | n78A |

5.6.3 ∆TIB and ∆RIB values

For DC\_7-26\_n78, the ΔTIB,c and ΔRIB,c values are reused from DC\_5-7\_n78 and are given in the tables below.

**Table 5.6.3-1:ΔTIB,c due to EN-DC (three bands)**

| Inter-band EN-DC configuration | ΔTIB,c for E-UTRA band / NR band (dB)6 | | |
| --- | --- | --- | --- |
| Component band in order of bands in configuration7 | | |
| DC\_7-26\_n78 | 0.6 | 0.6 | 0.8 |
| NOTE 6: “-” denotes ΔTIB,c = 0.  NOTE 7: The component band order in the configuration should be listed by the order of E-UTRA band and NR band respectively, such as for DC\_66\_(n)12 the band order from left to right is 12, 66 and n12. | | | |

**Table 5.6.3-2:ΔRIB,c due to EN-DC (three bands)**

| **Inter-band EN-DC configuration** | ΔRIB,c for E-UTRA band / NR band (dB)7 | | |
| --- | --- | --- | --- |
| Component band in order of bands in configuration8 | | |
| DC\_7-26\_n78 | 0.2 | 0.2 | 0.5 |
| NOTE 7: “-” denotes ΔRIB,c = 0.  NOTE 8: The component band order in the configuration should be listed by the order of E-UTRA band and NR band respectively, such as for DC\_5\_(n)12 the band order from left to right is 5, 12 and n12. | | | |

5.6.4 REFSENS requirements

There are IMD2 and IMD5 impact from UL 7\_n78 affecting DL band 26. MSD values are reused from DC\_5A-7A\_n78A.

There are IMD2 impact from UL 26\_n78 affecting DL band 7. MSD values are reused from DC\_5A-7A\_n78A.

Table 7.3B.2.3.5.2-1: 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-26A\_n78A  DC\_7C-26A\_n78A | 7 | 2525 | 5 | 25 | 2645 | 30.1 | IMD2 |
|  | 26 | 844 | 5 | 25 | 889 | N/A | N/A |
|  | n78 | 3489 | 10 | 50 | 3489 | N/A | N/A |
|  | 7 | 2550 | 5 | 25 | 2670 | N/A | N/A |
|  | 26 | 834 | 5 | 25 | 879 | 30.2 | IMD2 |
|  | n78 | 3429 | 10 | 50 | 3429 | N/A | N/A |
|  | 7 | 2525 | 5 | 25 | 2645 | N/A | N/A |
|  | 26 | 830 | 5 | 25 | 875 | 3.3 | IMD5 |
|  | n78 | 3350 | 10 | 50 | 3350 | N/A | N/A |

## 5.7 DC\_1A-8A\_n7A

5.7.1 Configurations for DC

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

| EN-DC  configuration | Uplink EN-DC  configuration  (NOTE 1) |
| --- | --- |
| DC\_1A-8A\_n7A | DC\_8A\_n7A  DC\_1A\_n7A |

5.7.2 Co-existence studies

For 2UL/3DL(DC\_1A-8A\_n7A with UL DC\_1A\_n7A) UE coexistence study 2nd, 3rd, 4th and 5th order harmonics and 2nd, 3rd, 4th and 5th order intermodulation products were calculated and presented in Table 5.239.2-1.

Table 5.7.2-1: Harmonic and IMD analysis for DC\_1A\_n7A

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **UE UL carriers** | **fx\_low** | **fx\_high** | **fy\_low** | **fy\_high** |
| **UL frequency (MHz)** | **1920** | **1980** | **2500** | **2570** |
| **2nd harmonics frequency limits** | **2\*fx\_low** | **2\*fx\_high** | **2\* fy\_low** | **2\* fy\_high** |
| **2nd harmonics frequency limits (MHz)** | **3840** | **3960** | **5000** | **5140** |
| **3rd harmonics frequency limits** | **3\*fx\_low** | **3\*fx\_high** | **3\* fy\_low** | **3\* fy\_high** |
| **3rd harmonics frequency limits (MHz)** | **5760** | **5940** | **7500** | **7710** |
| **4th harmonics frequency limits** | **4\*fx\_low** | **4\*fx\_high** | **4\* fy\_low** | **4\* fy\_high** |
| **4th harmonics frequency limits (MHz)** | **7680** | **7920** | **10000** | **10280** |
| **5th harmonics frequency limits** | **5\*fx\_low** | **5\*fx\_high** | **5\* fy\_low** | **5\* fy\_high** |
| **5th harmonics frequency limits (MHz)** | **9600** | **9900** | **12500** | **12850** |
| **2nd order IMD products** | **|fy\_low – fx\_high|** | **|fy\_high – fx\_low|** | **|fy\_low + fx\_low|** | **|fy\_high + fx\_high|** |
| **IMD frequency limits (MHz)** | **520** | **650** | **4420** | **4550** |
| **Two-tone 3rd order IMD products** | **|2\*fx\_low – fy\_high|** | **|2\*fx\_high – fy\_low|** | **|2\*fy\_low – fx\_high|** | **|2\*fy\_high – fx\_low|** |
| **IMD frequency limits (MHz)** | **1270** | **1460** | **3020** | **3220** |
| **Two-tone 3rd order IMD products** | **|2\*fx\_low + fy\_low|** | **|2\*fx\_high + fy\_high|** | **|2\*fy\_low + fx\_low|** | **|2\*fy\_high + fx\_high|** |
| **IMD frequency limits (MHz)** | **6340** | **6530** | **6920** | **7120** |
| **Two-tone 4th order IMD products** | **|3\*fx\_low –1\* fy\_high|** | **|3\*fx\_high – 1\*fy\_low|** | **|3\*fy\_low – 1\*fx\_high|** | **|3\*fy\_high – 1\*fx\_low|** |
| **IMD frequency limits (MHz)** | **3190** | **3440** | **5520** | **5790** |
| **Two-tone 4th order IMD products** | **|3\*fx\_low +1\* fy\_low|** | **|3\*fx\_high + 1\*fy\_high|** | **|3\*fy\_low + 1\*fx\_low|** | **|3\*fy\_high + 1\*fx\_high|** |
| **IMD frequency limits (MHz)** | **8260** | **8510** | **9420** | **9690** |
| **Two-tone 4th order IMD products** | **|2\*fx\_low –2\* fy\_high|** | **|2\*fx\_high –2\* fy\_low|** | **|2\*fx\_low +2\* fy\_low|** | **|2\*fx\_high +2\* fy\_high|** |
| **IMD frequency limits (MHz)** | **1300** | **1040** | **8840** | **9100** |
| **Two-tone 5th order IMD products** | **|fx\_low – 4\*fy\_high|** | **|fx\_high – 4\*fy\_low|** | **|fy\_low – 4\*fx\_high|** | **|fy\_high – 4\*fx\_low|** |
| **IMD frequency limits (MHz)** | **8360** | **8020** | **5420** | **5110** |
| **Two-tone 5th order IMD products** | **|2\*fx\_low - 3\*fy\_high|** | **|2\*fx\_high - 3\*fy\_low|** | **|2\*fy\_low - 3\*fx\_high|** | **|2\*fy\_high -3\*fx\_low|** |
| **IMD frequency limits (MHz)** | **3870** | **3540** | **940** | **620** |
| **Two-tone 5th order IMD products** | **|fx\_low + 4\*fy\_low|** | **|fx\_high + 4\*fy\_high|** | **|fy\_low + 4\*fx\_low|** | **|fy\_high + 4\*fx\_high|** |
| **IMD frequency limits (MHz)** | **11920** | **12260** | **10180** | **10490** |
| **Two-tone 5th order IMD products** | **|2\*fx\_low + 3\*fy\_low|** | **|2\*fx\_high + 3\*fy\_high|** | **|2\*fy\_low + 3\*fx\_low|** | **|2\*fy\_high + 3\*fx\_high|** |
| **IMD frequency limits (MHz)** | **11340** | **11670** | **10760** | **11080** |

As we can see from the above table，for 3DL\_DC\_1A-8A\_n7A with 2UL\_1A\_n7A，Two-tone 5th order IMD products |2\*fy -3\*fx |may fall into DL reception frequency of Band 8.

5.7.3 ∆TIB and ∆RIB values

The requirements of ∆TIB values in Table 6.2.5-3: ΔTIB,c (three bands) “CA\_1-7-8 , CA\_1-7-7-8”from TS36.101 [2] can be applied for DC\_1-8\_n7.

The requirements of ∆RIB values in Table 7.3.1-1B: ΔRIB,c (three bands) “CA\_1-7-8 , CA\_1-7-7-8” from TS36.101 [2] can be applied for DC\_1-8\_n7.

Table 5.7.3-1:ΔTIB,c due to EN-DC (three bands)

| Inter-band EN-DC configuration | ΔTIB,c for E-UTRA band / NR band (dB)6 | | |
| --- | --- | --- | --- |
| Component band in order of bands in configuration7 | | |
| DC\_1-8\_n7 | 0.5 | 0.6 | 0.6 |
| NOTE 6: “-” denotes ΔTIB,c = 0.  NOTE 7: The component band order in the configuration should be listed by the order of E-UTRA band and NR band respectively, such as for DC\_66\_(n)12 the band order from left to right is 12, 66 and n12. | | | |

Table 5.7.3-2:ΔRIB,c due to EN-DC (three bands)

| **Inter-band EN-DC configuration** | ΔRIB,c for E-UTRA band / NR band (dB)7 | | |
| --- | --- | --- | --- |
| Component band in order of bands in configuration8 | | |
| DC\_1-8\_n7 | - | 0.2 | - |
| NOTE 7: “-” denotes ΔRIB,c = 0.  NOTE 8: The component band order in the configuration should be listed by the order of E-UTRA band and NR band respectively, such as for DC\_5\_(n)12 the band order from left to right is 5, 12 and n12. | | | |

5.7.4 Reference sensitivity exceptions

Table 5.7.4-1 shows the required MSD levels for the DC configuration. The required MSD values are derived from DC\_1A-8A\_n7A.

Table 5.7.4-1: Reference sensitivity exceptions for Scell due to dual uplink operation for EN-DC in NR FR1 (three bands)

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| E-UTRA and NR 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\_n7A | 1 | 1977.5 | 5 | 25 | 2167.5 | N/A | N/A |
| n7 | 2502.5 | 5 | 25 | 2622.5 | N/A | N/A |
| 8 | 882.5 | 5 | 25 | 927.5 | 1.0 | IMD5 |

## 5.8 DC\_3-8\_n78, DC\_3-3-8\_n78

### 5.8.1 Configurations for DC

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

| **EN-DC**  **configuration** | **Uplink EN-DC**  **configuration** |
| --- | --- |
| DC\_3A-8B\_n78A5 | DC\_3A\_n78A  DC\_8A\_n78A  DC\_8B\_n78A |
| DC\_3A-3A-8B\_n78A5 | DC\_3A\_n78A  DC\_8A\_n78A  DC\_8B\_n78A |
| NOTE 5: Applicable for UE supporting inter-band EN-DC with mandatory simultaneous Rx/Tx capability | |

### 5.8.2 Co-existence studies

Co-existence was studied for DC\_3A-8A\_n78A in Rel-15 and the results are captured in TR 37.863-02-01. Based on the study for the impact on the third band, the 3rd order IMD generated by dual uplink of Band 8 + Band n78 may fall into own Rx of band 3.

### 5.8.3 ∆TIB and ∆RIB values

For DC\_3A-8B\_n78A, DC\_3A-3A-8B\_n78A, the ΔTIB,c and ΔRIB,c values are already covered by the DC\_3-8\_n78, DC\_3-3-8\_n78, as in the tables below.

Table 5.8.3-1: ΔTIB,c

| Inter-band EN-DC configuration | ΔTIB,c for E-UTRA band / NR band (dB)6 | | |
| --- | --- | --- | --- |
| Component band in order of bands in configuration7 | | |
| DC\_3-8\_n78  DC\_3-3-8\_n78 | 0.6 | 0.6 | 0.8 |

**Table 5.8.3-2: ΔRIB**,c

| **Inter-band EN-DC configuration** | ΔRIB,c for E-UTRA band / NR band (dB)7 | | |
| --- | --- | --- | --- |
| Component band in order of bands in configuration8 | | |
| DC\_3-8\_n78  DC\_3-3-8\_n78 | 0.2 | 0.2 | 0.5 |

### 5.8.4 Reference sensitivity exceptions

For the MSD requirements for IMD interference of DC\_3A-8B\_n78A and DC\_3A-3A-8B\_n78A, the requirements for DC\_3A-8A\_n78A and DC\_3A-3A-8A\_n78A can be referred as below.

**Table 5.8.4-1: 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-8B\_n78A  DC\_3A-3A-8B\_n78A | 8 | 910 | 5 | 25 | 955 | N/A | N/A |
|  | n78 | 3640 | 10 | 50 | 3640 | N/A | N/A |
|  | 3 | 1725 | 5 | 25 | 1820 | 16.5 | IMD3 |

The UL triple beat analysis for the three uplink CCs from the DC\_8B\_n78A impact to the 3rd DL band is provided below.

Based on the WF R4-2220556, the UL TB analysis focus on the potential de-sense when the following 1st order triple beat product fallls into the Rx frequency range of the third band:

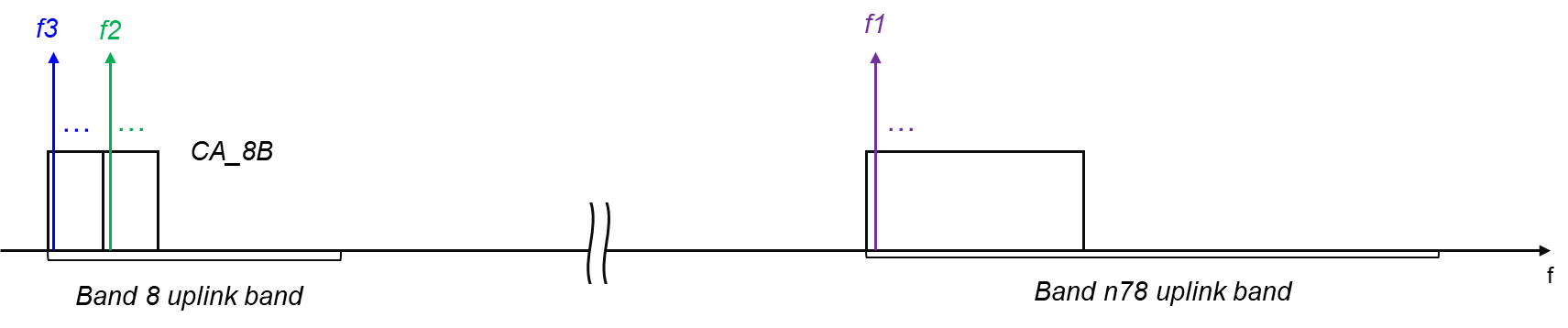
TB1 = |f1+f2-f3|

TB2 = |f1-f2+f3|

TB3 = |f1-f2-f3|

TB4 = f1+f2+f3

In the above equations, f1 is the center frequency of the non-UL CA uplink resource block (RB), and f2 and f3 are the center frequencies of each of the UL CA CC uplink RB, with the consideration of 1RB case. See figure below.



**Figure 5.9.4-1: UL triple beat of DC\_8B\_n78A**

Here we provide a approximate checking on the TB impact in the below table.

**Table 5.9.4-2: The impacted frequency range of 1st order TB of UL DC\_8B\_n78A**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **UL carriers** | **f1\_low** | **f1\_high** | **min |f2-f3|** | **max |f2-f3|** | **min |f2+f3|** | **max |f2+f3|** |
| frequqncy (MHz) | 3300 | 3800 | ~0 | ~20 | ~1770 | ~1820 |
| **TB1 = |f1+f2-f3|** | **min TB1** | **max TB1** | **TB2 = |f1-f2+f3|** | **min TB2** | **max TB2** |  |
| frequqncy limit (MHz) | ~3300 | ~3820 |  | ~3280 | ~3800 |  |
| **TB3 = |f1-f2-f3|** | **min TB3** | **max TB3** | **TB4 = |f1+f2+f3|** | **min TB4** | **max TB4** |  |
| frequqncy limit (MHz) | **~1480** | **~2030** |  | ~5070 | ~5620 |  |
| Note: assume f2 > f3 | | | | | | |

Based on Table 5.9.4-2, TB3 might fall into Rx frequency range of the 3rd band, band 3, so additional MSD might be needed. The additional MSD requirement is provided in table below.

**Table 5.9.4-3: The MSD requirement for 1st order TB of UL DC\_8B\_n78A**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| ENDC band combination | NR/LTE band | UL Fc  (MHz) | UL/DL BW  (MHz) | UL  LCRB | DL Fc (MHz) | MSD  (dB) | Duplex mode | IMD order |
| DC\_3A-8B\_n78A | 3 | N/A | 5 | N/A | 1845 | **4.1** | FDD | IMD3 |
|  | 8 | 900 | 10 | 1 (RBSTART=35) | 945 | N/A | FDD | N/A |
|  |  | 910 | 10 | 1 (RBSTART=30) | 955 | N/A | FDD | N/A |
|  | n78 | 3660 | 10 | 25 (RBSTART=0) | 3660 | N/A | TDD | N/A |

The detail MSD analysis is in R4-2310410. Note that the UL RB setting of the CA\_8B configuration is further updated to eliminate band 8 self-desense, and it also doesn’t create overlap of TB and IMD3 in band 3.

However, based on the agreed WF R4-2310316, it is found that if TB frequency is composed of the frequency sum of the 2 discrete RBs in the contiguous UL CA, there is no need to specify the TB test configuration as the requirement can already be verified by the fallback 2UL IMD3. Hence, the MSD requirement proposed in table 5.9.4-3 will be a reference for the TR, and will not need to be specified in the TS specification.

## 5.9 DC\_7-8\_n78, DC\_7-7-8\_n78

### 5.9.1 Configurations for DC

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

| **EN-DC**  **configuration** | **Uplink EN-DC**  **configuration** |
| --- | --- |
| DC\_7A-8B\_n78A5 | DC\_7A\_n78A  DC\_8A\_n78A  DC\_8B\_n78A |
| DC\_7A-7A-8B\_n78A5 | DC\_7A\_n78A  DC\_8A\_n78A  DC\_8B\_n78A |
| NOTE 5: Applicable for UE supporting inter-band EN-DC with mandatory simultaneous Rx/Tx capability | |

### 5.9.2 Co-existence studies

Co-existence was studied for DC\_7A-8A\_n78A in Rel-16 and the results are captured in TR 37.716-21-11. Based on the study for the impact on the third band,

- 2nd and 5th order IM generated by dual uplink of Band 7 and n78 may fall into Band 8

- 2nd order IM generated by dual uplink of Band 8 and n78 may fall into Band 7

### 5.9.3 ∆TIB and ∆RIB values

For DC\_7A-8B\_n78A, DC\_7A-7A-8B\_n78A, the ΔTIB,c and ΔRIB,c values are already covered by the DC\_7-8\_n78, as in the tables below.

Table 5.9.3-1: ΔTIB,c

| Inter-band EN-DC configuration | ΔTIB,c for E-UTRA band / NR band (dB)6 | | |
| --- | --- | --- | --- |
| Component band in order of bands in configuration7 | | |
| DC\_7-8\_n78  DC\_7-7-8\_n78 | 0.5 | 0.6 | 0.8 |

**Table 5.9.3-2: ΔRIB**,c

| **Inter-band EN-DC configuration** | ΔRIB,c for E-UTRA band / NR band (dB)7 | | |
| --- | --- | --- | --- |
| Component band in order of bands in configuration8 | | |
| DC\_7-8\_n78  DC\_7-7-8\_n78 | 0 | 0.2 | 0.5 |

### 5.9.4 Reference sensitivity exceptions

For the MSD requirements for IMD interference of DC\_7A-8B\_n78A and DC\_7A-7A-8B\_n78A, the requirements for DC\_7A-8A\_n78A can be referred as below.

**Table 5.9.4-1: 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-8B\_n78A  DC\_7A-7A-8B\_n78A | 7 | 2530 | 5 | 25 | 2650 | N/A | N/A |
|  | 8 | 895 | 5 | 25 | 940 | 30.5 | IMD2 |
|  | n78 | 3470 | 10 | 50 | 3470 | N/A | N/A |
|  | 7 | 2520 | 5 | 25 | 2640 | N/A | N/A |
|  | 8 | 895 | 5 | 25 | 940 | 3.1 | IMD5 |
|  | n78 | 3310 | 10 | 50 | 3310 | N/A | N/A |
|  | 7 | 2530 | 5 | 25 | 2650 | 28 | IMD2 |
|  | 8 | 895 | 5 | 25 | 940 | N/A | N/A |
|  | n78 | 3545 | 10 | 50 | 3545 | N/A | N/A |

The UL triple beat analysis for the three uplink CCs from the DC\_8B\_n78A impact to the 3rd DL band is provided below.

Based on the WF R4-2220556, the UL TB analysis focus on the potential de-sense when the following 1st order triple beat product fallls into the Rx frequency range of the third band:

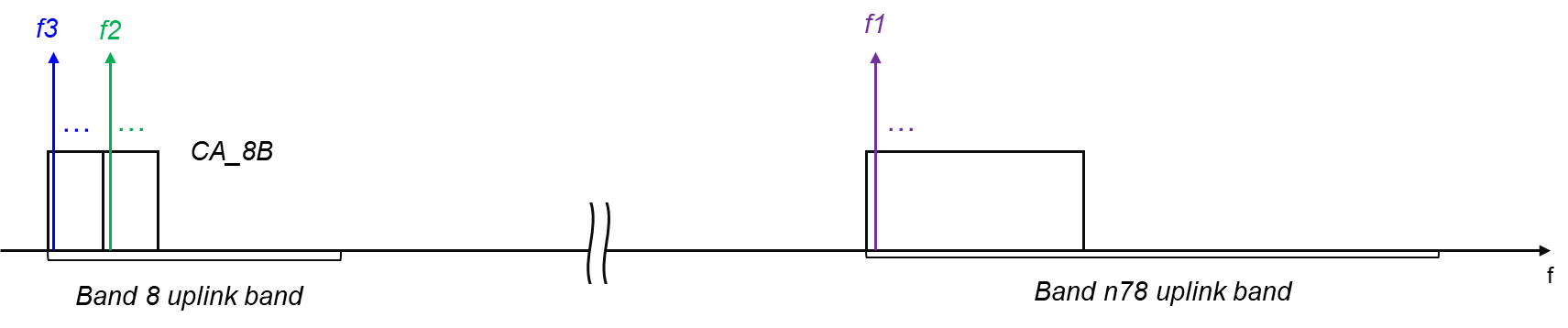
TB1 = |f1+f2-f3|

TB2 = |f1-f2+f3|

TB3 = |f1-f2-f3|

TB4 = f1+f2+f3

In the above equations, f1 is the center frequency of the non-UL CA uplink resource block (RB), and f2 and f3 are the center frequencies of each of the UL CA CC uplink RB, with the consideration of 1RB case. See figure below.



**Figure 5.9.4-1: UL triple beat of DC\_8B\_n78A**

Here we provide an approximate checking on the TB impact in the below table.

**Table 5.9.4-2: The impacted frequency range of 1st order TB of UL DC\_8B\_n78A**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **UL carriers** | **f1\_low** | **f1\_high** | **min |f2-f3|** | **max |f2-f3|** | **min |f2+f3|** | **max |f2+f3|** |
| frequqncy (MHz) | 3300 | 3800 | ~0 | ~20 | ~1770 | ~1820 |
| **TB1 = |f1+f2-f3|** | **min TB1** | **max TB1** | **TB2 = |f1-f2+f3|** | **min TB2** | **max TB2** |  |
| frequqncy limit (MHz) | ~3300 | ~3820 |  | ~3280 | ~3800 |  |
| **TB3 = |f1-f2-f3|** | **min TB3** | **max TB3** | **TB4 = |f1+f2+f3|** | **min TB4** | **max TB4** |  |
| frequqncy limit (MHz) | ~1480 | ~2030 |  | ~5070 | ~5620 |  |
| Note: assume f2 > f3 | | | | | | |

Based on Table 5.9.4-2, there is no TB falls into the Rx frequency range of the 3rd band, band 7, so it can be concluded that no additional MSD is needed.

## 5.10 DC\_1-3\_n26

5.10.1 Operating bands for EN-DC

Table 5.10.1-1: Band combinations EN-DC (three bands)

| EN-DC band | E-UTRA CA band | NR band | Single UL allowed |
| --- | --- | --- | --- |
| DC\_1-3\_n26 | CA\_1-3 | n26 | No |

### 5.10.2 Configuration for DC

Table 5.10.2-1: Inter-band EN-DC configurations (three bands)

| EN-DC  Configuration | Uplink EN-DC  configuration  (NOTE 1) | E-UTRA CA configuration | NR band |
| --- | --- | --- | --- |
| DC\_1A-3A\_n26A | DC\_1A\_n26A  DC\_3A\_n26A | CA\_1A-3A | n26A |
| DC\_1A-3C\_n26A | DC\_1A\_n26A  DC\_3A\_n26A  DC\_3C\_n26A | CA\_1A-3A  CA\_1A-3C | n26A |

5.10.3 ∆TIB and ∆RIB values

For DC\_1-3\_n26, the ΔTIB,c and ΔRIB,c values are reused from DC\_1-3\_n5 and are given in the tables below.

**Table 5.10.3-1: ΔTIB,c**

| Inter-band EN-DC configuration | ΔTIB,c for E-UTRA band / NR band (dB)6 | | |
| --- | --- | --- | --- |
| Component band in order of bands in configuration7 | | |
| DC\_1-3\_n26 | 0.3 | 0.3 | 0.3 |

**Table 5.10.3-2: ΔRIB**

| **Inter-band EN-DC configuration** | ΔRIB,c for E-UTRA band / NR band (dB)7 | | |
| --- | --- | --- | --- |
| Component band in order of bands in configuration8 | | |
| DC\_1-3\_n26 | 0 | 0 | 0 |

5.10.4 REFSENS requirements

Reusing the coexistence study results from DC\_1-3\_n5, there is no need to define MSD values for DC\_1-3\_n26.

## 5.11 DC\_1-7\_n26

5.11.1 Operating bands for EN-DC

Table 5.11.1-1: Band combinations EN-DC (three bands)

| EN-DC band | E-UTRA CA band | NR band | Single UL allowed |
| --- | --- | --- | --- |
| DC\_1-7\_n26 | CA\_1-7 | n26 | No |

### 5.11.2 Configuration for DC

Table 5.11.2-1: Inter-band EN-DC configurations (three bands)

| EN-DC  Configuration | Uplink EN-DC  configuration  (NOTE 1) | E-UTRA CA configuration | NR band |
| --- | --- | --- | --- |
| DC\_1A-7A\_n26A | DC\_1A\_n26A  DC\_7A\_n26A | CA\_1A-7A | n26A |
| DC\_1A-7C\_n26A | DC\_1A\_n26A  DC\_7A\_n26A  DC\_7C\_n26A | CA\_1A-7A  CA\_1A-7C | n26A |

5.11.3 ∆TIB and ∆RIB values

For DC\_1-7\_n26, the ΔTIB,c and ΔRIB,c values are reused from DC\_1-7\_n5 and are given in the tables below.

**Table 5.11.3-1: ΔTIB,c**

| Inter-band EN-DC configuration | ΔTIB,c for E-UTRA band / NR band (dB)6 | | |
| --- | --- | --- | --- |
| Component band in order of bands in configuration7 | | |
| DC\_1-7\_n26 | 0.5 | 0.6 | 0.3 |

**Table 5.11.3-2: ΔRIB**

| **Inter-band EN-DC configuration** | ΔRIB,c for E-UTRA band / NR band (dB)7 | | |
| --- | --- | --- | --- |
| Component band in order of bands in configuration8 | | |
| DC\_1-7\_n26 | 0 | 0 | 0 |

5.11.4 REFSENS requirements

Reusing the coexistence study results from DC\_1-7\_n5, there is no need to define MSD values for DC\_1-7\_n26.

## 5.12 DC\_3-7\_n26

5.12.1 Operating bands for EN-DC

Table 5.12.1-1: Band combinations EN-DC (three bands)

| EN-DC band | E-UTRA CA band | NR band | Single UL allowed |
| --- | --- | --- | --- |
| DC\_3-7\_n26 | CA\_3-7 | n26 | Yes |

### 5.12.2 Configuration for DC

Table 5.12.2-1: Inter-band EN-DC configurations (three bands)

| EN-DC  Configuration | Uplink EN-DC  configuration  (NOTE 1) | E-UTRA CA configuration | NR band |
| --- | --- | --- | --- |
| DC\_3A-7A\_n26A | DC\_3A\_n26A  DC\_7A\_n26A | CA\_3A-7A | n26A |
| DC\_3A-7C\_n26A | DC\_3A\_n26A  DC\_7A\_n26A  DC\_7C\_n26A | CA\_3A-7A  CA\_3A-7C | n26A |
| DC\_3C-7A\_n26A | DC\_3A\_n26A  DC\_3C\_n26A  DC\_7A\_n26A | CA\_3A-7A  CA\_3C-7A | n26A |
| DC\_3C-7C\_n26A | DC\_3A\_n26A  DC\_3C\_n26A  DC\_7A\_n26A  DC\_7C\_n26A | CA\_3A-7A  CA\_3A-7C  CA\_3C-7A  CA\_3C-7C | n26A |

5.12.3 ∆TIB and ∆RIB values

For DC\_3-7\_n26, the ΔTIB,c and ΔRIB,c values are reused from DC\_3-7\_n5 and are given in the tables below.

**Table 5.12.3-1: ΔTIB,c**

| Inter-band EN-DC configuration | ΔTIB,c for E-UTRA band / NR band (dB)6 | | |
| --- | --- | --- | --- |
| Component band in order of bands in configuration7 | | |
| DC\_3-7\_n26 | 0.5 | 0.5 | 0.3 |

**Table 5.12.3-2: ΔRIB**

| **Inter-band EN-DC configuration** | ΔRIB,c for E-UTRA band / NR band (dB)7 | | |
| --- | --- | --- | --- |
| Component band in order of bands in configuration8 | | |
| DC\_3-7\_n26 | 0 | 0 | 0 |

5.12.4 REFSENS requirements

Based on the discussions in R4-2219700 and reusing the coexistence study results from EN-DC combination DC\_3-7\_n5, MSD values should be defined as below:

Table 7.3B.2.3.5.2-1: Reference sensitivity exceptions for Scell due to dual uplink operation for EN-DC in NR FR1 (three bands)

| **EN-DC Configuration** | **EUTRA/NR band** | **UL Fc  (MHz)** | **UL/DL BW  (MHz)** | **UL**  **LCRB** | **DL Fc (MHz)** | **MSD  (dB)** | **Duplex mode** | **IMD order** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| DC\_3A-7A\_n26A  DC\_3A-7C\_n26A  DC\_3C-7C\_n26A  DC\_3C-7A\_n26A | 3 | 1780 | 10 | 50 | 1875 | N/A | FDD | N/A |
| 7 | 2505 | 10 | 50 | 2625 | 30.0 | IMD2 |
| n26 | 845 | 5 | 25 | 890 | N/A | N/A |
| DC\_3C-7A\_n26A  DC\_3C-7C\_n26A | 3 | 1755 | 20 | 1(RBSTART=20) | 1850 | N/A | FDD | N/A |
|  | 1774.8 | 20 | 1(RBSTART=79) | 1869.8 | N/A |  |  |
| 7 | N/A | 5 | N/A | 2682.5 | **19** | FDD | IMD3 |
| n26 | 846.5 | 5 | 25(RBSTART=0) | 891.5 | N/A | FDD | N/A |

## 5.13 DC\_3-41\_n1

### 5.13.1 Configuration for DC

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

| EN-DC  Configuration | Uplink EN-DC  configuration  (NOTE 1) | E-UTRA CA configuration | NR band |
| --- | --- | --- | --- |
| DC\_3A-41A\_n1A | DC\_3A\_n1A  DC\_41A\_n1A | CA\_3A-41A | n1A |
| DC\_3A-41C\_n1A | DC\_3A\_n1A  DC\_41A\_n1A  DC\_41C\_n1A | CA\_3A-41C | n1A |
| DC\_3A-3A-41A\_n1A | DC\_3A\_n1A  DC\_41A\_n1A | CA\_3A-3A-41A | n1A |
| DC\_3A-3A-41C\_n1A | DC\_3A\_n1A  DC\_41A\_n1A  DC\_41C\_n1A | CA\_3A-3A-41C | n1A |

### 5.13.2 Co-existence studies

When uplink is DC\_3A\_n1A there is IMD5 interfering band 41 downlink.

### 5.13.3 ∆TIB and ∆RIB values

For DC\_3-41\_n1, the ΔTIB,c and ΔRIB,c values are reused from DC\_1\_n3-n41 and are given in the tables below.

**Table 5.13.3-1: ΔTIB,c**

| Inter-band EN-DC configuration | ΔTIB,c for E-UTRA band / NR band (dB)6 | | |
| --- | --- | --- | --- |
| Component band in order of bands in configuration7 | | |
| DC\_3-41\_n1 | 0.5 | 0.33 / 0.84 | 0.5 |
| NOTE 3: The requirement is applied for UE transmitting on the frequency range of 2515 – 2690 MHz.  NOTE 4: The requirement is applied for UE transmitting on the frequency range of 2496 – 2515 MHz. | | | |

**Table 5.13.3-2: ΔRIB,c**

| **Inter-band EN-DC configuration** | ΔRIB,c for E-UTRA band / NR band (dB)7 | | |
| --- | --- | --- | --- |
| Component band in order of bands in configuration8 | | |
| DC\_3-41\_n1 | - | 03 / 0.54 | - |
| NOTE 3: The requirement is applied for UE transmitting on the frequency range of 2515 - 2690 MHz.  NOTE 4: The requirement is applied for UE transmitting on the frequency range of 2496 – 2515 MHz | | | |

5.13.4 REFSENS requirements

It is proposed to re-use the IMD5 MSD values from already specified configuration DC\_1\_n3-n41 which is similar to DC\_3-41\_n1.

Table 7.3B.2.3.5.2-1: 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-41A\_n1A  DC\_3A-41C\_n1A  DC\_3A-3A-41A\_n1A  DC\_3A-3A-41C\_n1A | n1 | 1977.5 | 5 | 25 | 2167.5 | N/A | N/A |
|  | 3 | 1712.5 | 5 | 25 | 1807.5 | N/A | N/A |
|  | 41 | 2507.5 | 5 | 25 | 2507.5 | 5.0 | IMD5 |

## 5.14 DC\_8-41\_n78

### 5.14.1 Configuration for DC

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

| EN-DC  Configuration | Uplink EN-DC  configuration  (NOTE 1) | E-UTRA CA configuration | NR band |
| --- | --- | --- | --- |
| DC\_8A-41A\_n78A | DC\_8A\_n78A  DC\_41A\_n78A | CA\_8A-41A | n78A |
| DC\_8A-41C\_n78A | DC\_8A\_n78A  DC\_41A\_n78A  DC\_41C\_n78A | CA\_8A-41C | n78A |

### 5.14.2 Co-existence studies

When uplink is DC\_8A\_n78A there is IMD2 interfering band 41 downlink.

When uplink is DC\_41A\_n78A there is IMD2 and IMD5 interfering band 8 downlink.

### 5.14.3 ∆TIB and ∆RIB values

For DC\_8-41\_n78, the ΔTIB,c and ΔRIB,c values are reused from DC\_8-41\_n77A and are given in the tables below.

**Table 5.14.3-1: ΔTIB,c**

| Inter-band EN-DC configuration | ΔTIB,c for E-UTRA band / NR band (dB)6 | | |
| --- | --- | --- | --- |
| Component band in order of bands in configuration7 | | |
| DC\_8-41\_n78 | 0.6 | 0.3 | 0.8 |

**Table 5.14.3-2: ΔRIB,c**

| **Inter-band EN-DC configuration** | ΔRIB,c for E-UTRA band / NR band (dB)7 | | |
| --- | --- | --- | --- |
| Component band in order of bands in configuration8 | | |
| DC\_8-41\_n78 | 0.2 | - | 0.5 |

5.14.4 REFSENS requirements

It is proposed to re-use the IMD2 MSD values from already specified configuration DC\_8-41\_n77 which is similar to DC\_8-41\_n78.

Table 7.3B.2.3.5.2-1: 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\_8A-41A\_n78A  DC\_8A-41C\_n78A | 8 | 905 | 5 | 25 | 950 | 29.1 | IMD24 |
|  | 41 | 2630 | 5 | 25 | 2630 | N/A | N/A |
|  | n78 | 3580 | 10 | 50 | 3580 | N/A | N/A |
|  | 8 | 895 | 5 | 25 | 940 | N/A | N/A |
|  | 41 | 2650 | 5 | 25 | 2650 | 28.0 | IMD2 |
|  | n78 | 3545 | 10 | 50 | 3545 | N/A | N/A |
| NOTE 4: This band is subject to IMD5 also which MSD is not specified. | | | | | | | |

## 5.15 DC\_20-41\_n1

### 5.15.1 Configuration for DC

Table 5.15.2-1: Inter-band EN-DC configurations (three bands)

| EN-DC  Configuration | Uplink EN-DC  configuration  (NOTE 1) | E-UTRA CA configuration | NR band |
| --- | --- | --- | --- |
| DC\_20A-41A\_n1A | DC\_20A\_n1A  DC\_41A\_n1A | CA\_20A-41A | n1A |
| DC\_20A-41C\_n1A | DC\_20A\_n1A  DC\_41A\_n1A  DC\_41C\_n1A | CA\_20A-41C | n1A |

### 5.15.2 Co-existence studies

There is no impact from UL 20\_n1 affecting DL band 41.

There are IMD5 impact from UL 41\_n1 affecting DL band 20.

5.15.3 ∆TIB and ∆RIB values

For DC\_20-41\_n1, the ΔTIB,c and ΔRIB,c values are reused from DC\_1-20\_n41 and are given in the tables below.

**Table 5.15.3-1: ΔTIB,c**

| Inter-band EN-DC configuration | ΔTIB,c for E-UTRA band / NR band (dB)6 | | |
| --- | --- | --- | --- |
| Component band in order of bands in configuration7 | | |
| DC\_20-41\_n1 | 0.3 | 0.51 / 1.22 | 0.5 |
| NOTE 1: The requirement is applied for UE transmitting on the frequency range of 2545 - 2690 MHz.  NOTE 2: The requirement is applied for UE transmitting on the frequency range of 2496 - 2545 MHz. | | | |

**Table 5.15.3-2: ΔRIB**

| **Inter-band EN-DC configuration** | ΔRIB,c for E-UTRA band / NR band (dB)7 | | |
| --- | --- | --- | --- |
| Component band in order of bands in configuration8 | | |
| DC\_20-41\_n1 | 0 | 0 | 0 |

5.15.4 REFSENS requirements

MSD values are reused from DC\_1A-20A\_n7A.

Table 7.3B.2.3.5.2-1: 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\_20A-41A\_n1A | 20 | 841 | 5 | 25 | 800 | 4.5 | IMD5 |
| DC\_20A-41C\_n1A | 41 | 2510 | 10 | 50 | 2510 | N/A | N/A |
|  | n1 | 1940 | 5 | 25 | 2130 | N/A | N/A |

## 5.16 DC\_20-41\_n78

### 5.16.1 Configuration for DC

Table 5.16.2-1: Inter-band EN-DC configurations (three bands)

| EN-DC  Configuration | Uplink EN-DC  configuration  (NOTE 1) | E-UTRA CA configuration | NR band |
| --- | --- | --- | --- |
| DC\_20A-41A\_n78A | DC\_20A\_n78A  DC\_41A\_n78A | CA\_20A-41A | n78A |
| DC\_20A-41C\_n78A | DC\_20A\_n78A  DC\_41A\_n78A  DC\_41C\_n78A | CA\_20A-41C | n78A |

### 5.16.2 Co-existence studies

There are IMD2 impact from UL 20\_n78 affecting DL band 41.

There are IMD2 and IMD5 impact from UL 41\_n78 affecting DL band 20.

5.16.3 ∆TIB and ∆RIB values

For DC\_20-41\_n78, the ΔTIB,c and ΔRIB,c values are reused from DC\_20\_n41-n78 and are given in the tables below.

**Table 5.16.3-1: ΔTIB,c**

| Inter-band EN-DC configuration | ΔTIB,c for E-UTRA band / NR band (dB)6 | | |
| --- | --- | --- | --- |
| Component band in order of bands in configuration7 | | |
| DC\_20-41\_n78 | 0.5 | 0.3 | 0.8 |

**Table 5.16.3-2: ΔRIB**

| **Inter-band EN-DC configuration** | ΔRIB,c for E-UTRA band / NR band (dB)7 | | |
| --- | --- | --- | --- |
| Component band in order of bands in configuration8 | | |
| DC\_20-41\_n78 | 0 | 0 | 0.5 |

5.16.4 REFSENS requirements

MSD value band 41 is reused from DC\_20A\_n41A-n78A.

MSD value band 20 is reused from CA\_n28A-n41A-n78A.

Table 7.3B.2.3.5.2-1: 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\_20A-41A\_n78A | 20 | 845 | 5 | 25 | 804 | N/A | N/A |
| DC\_20A-41C\_n78A | 41 | 2675 | 10 | 50 | 2675 | 29.8 | IMD2 |
|  | n78 | 3520 | 10 | 50 | 3520 | N/A | N/A |
|  | 20 | 839 | 5 | 25 | 798 | 30.8 | IMD24 |
|  | 41 | 2642 | 10 | 50 | 2642 | N/A | N/A |
|  | n78 | 3440 | 10 | 50 | 3440 | N/A | N/A |
| NOTE 4: This band is subject to IMD5 also which MSD is not specified | | | | | | | |

## 5.17 DC\_1-7\_n1

### 5.17.1 Configurations for DC

Table 5.17.1-1: Inter-band DC configurations (three bands)

| **EN-DC**  **configuration** | **Uplink EN-DC**  **configuration**  **(NOTE 1)** |
| --- | --- |
| DC\_1A-7A\_n1A | DC\_1A\_n1A  DC\_7A\_n1A |

### 5.17.2 Co-existence studies

Table 5.17.2-1 lists the Band 7A + Band n1A 2UL DC 2nd and 3rd order harmonics and 2nd, 3rd, 4th and 5th order IMD for the UE-to-UE coexistence analysis.

Table 5.17.2-1: Band 7 and Band n1 UL harmonics and IMD products

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **UE UL carriers** | **fx\_low** | **fx\_high** | | **fn\_low** | **fn\_high** | |
| UL frequency (MHz) | 2500 | 2570 | | 1920 | 1980 | |
| 2nd harmonics frequency limits | 2\*fx\_low | 2\*fx\_high | | 2\* fn\_low | 2\* fn\_high | |
| 2nd harmonics frequency limits (MHz) | 5000 – 5140 | | | 3840 – 3960 | | |
| 3rd harmonics frequency limits | 3\*fx\_low | | 3\*fx\_high | 3\* fn\_low | | 3\* fn\_high |
| 3rd harmonics frequency limits (MHz) | 7500 – 7710 | | | 5760 – 5940 | | |
| 2nd order IMD products | |fn\_low – fx\_high| | |fn\_high – fx\_low| | | |fn\_low + fx\_low| | |fn\_high + fx\_high| | |
| IMD frequency limits (MHz) | 520 – 650 | | | 4420 – 4550 | | |
| Two-tone 3rd order IMD products | |2\*fx\_low – fn\_high| | |2\*fx\_high – fn\_low| | | |2\*fn\_low – fx\_high| | |2\*fn\_high – fx\_low| | |
| IMD frequency limits (MHz) | 3020 – 3220 | | | 1270 – 1460 | | |
| Two-tone 3rd order IMD products | |2\*fx\_low + fn\_low| | |2\*fx\_high + fn\_high| | | |2\*fn\_low + fx\_low| | |2\*fn\_high + fx\_high| | |
| IMD frequency limits (MHz) | 6920 – 7120 | | | 6340 – 6530 | | |
| Two-tone 3rd order IMD products | (fx\_low – max BW fn) | | (fx\_high + max BW fn) | (fn\_low – max BW fx) | | (fn\_high + max BW fx) |
| IMD frequency limits (MHz) | 2450 – 2620 | | | 1900 – 2000 | | |
| Two-tone 4th order IMD products | |3\*fx\_low –1\* fn\_high| | | |3\*fx\_high – 1\*fn\_low| | |3\*fn\_low – 1\*fx\_high| | | |3\*fn\_high – 1\*fx\_low| |
| IMD frequency limits (MHz) | 5520 – 5790 | | | 3190 – 3440 | | |
| Two-tone 4th order IMD products | |2\*fx\_low –2\* fn\_high| | | |2\*fx\_high –2\* fn\_low| | |2\*fx\_low +2\* fn\_low| | | |2\*fx\_high +2\* fn\_high| |
| IMD frequency limits (MHz) | 1040 – 1300 | | | 8840 – 9100 | | |
| Two-tone 4th order IMD products | |3\*fx\_low +1\* fn\_low| | | |3\*fx\_high + 1\*fn\_high| | |3\*fn\_low + 1\*fx\_low| | | |3\*fn\_high + 1\*fx\_high| |
| IMD frequency limits (MHz) | 9420 – 9690 | | | 8260 – 8510 | | |
| Two-tone 5th order IMD products | |fx\_low – 4\*fn\_high| | | |fx\_high – 4\*fn\_low| | |fn\_low – 4\*fx\_high| | | |fn\_high – 4\*fx\_low| |
| IMD frequency limits (MHz) | 5110 – 5420 | | | 8020 – 8360 | | |
| Two-tone 5th order IMD products | |2\*fx\_low - 3\*fn\_high| | | |2\*fx\_high - 3\*fn\_low| | |2\*fn\_low - 3\*fx\_high| | | |2\*fn\_high -3\*fx\_low| |
| IMD frequency limits (MHz) | 620 – 940 | | | 3540 – 3870 | | |
| Two-tone 5th order IMD products | |fx\_low + 4\*fn\_low| | | |fx\_high + 4\*fn\_high| | |fn\_low + 4\*fx\_low| | | |fn\_high + 4\*fx\_high| |
| IMD frequency limits (MHz) | 10180 – 10490 | | | 11920 – 12260 | | |
| Two-tone 5th order IMD products | |2\*fx\_low + 3\*fn\_low| | | |2\*fx\_high + 3\*fn\_high| | |2\*fn\_low + 3\*fx\_low| | | |2\*fn\_high + 3\*fx\_high| |
| IMD frequency limits (MHz) | 10760 – 11080 | | | 11340 – 11670 | | |

Based on Table 5.17.2-1,

- 2nd order harmonics may fall into Rx frequencies of band 46 and 47.

- 3rd order harmonics may fall into Rx frequencies of band 77.

- 2nd order IMD may fall into Rx frequencies of bands 71 and 79.

- 3rd order IMD may fall into Rx frequencies of bands 32, 45, 50, 51, 75, 76, 91, 92, 93 and 94.

- 4th order IMD may fall into Rx frequencies of bands 42, 46, 52, 77 and 78.

- 5th order IMD may fall into Rx frequencies of bands 5, 6, 8, 12, 13, 14, 17, 18, 19, 20, 22, 26, 27, 28, 29, 42, 43, 44, 46, 48, 49, 67, 68, 71, 77, 78 and 85.

When a 2UL inter-band DC UE is operating with other systems such as Wi-Fi, Bluetooth and GNSS, the harmonics and intermodulation products can have an impact on these systems. Table 5.17.2-2 lists if up to 3rd order harmonics and IMD up to 5th order falls into one of these receiving bands.

Table 5.17.2-2: 2UL Band 7 + Band n1 harmonic and IMD for ISM and GNSS bands

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Victim Systems** | **Frequency range [MHz]** | | | **Impact** | **Regions** | **Comments** |
| COMPASS  (Beidou) | 1559 | - | 1591 | No |  |  |
| Galileo | 1559 | - | 1591 | No |  |  |
| GLONASS | 1591 | - | 1610 | No |  |  |
| GPS | 1563 | - | 1587 | No |  |  |
| ISM band  (2.4GHz) | 2400 | - | 2483.5 | No | US/Europe |  |
| 2400 | - | 2494 | No | Asia |  |
| ISM band  (5GHz) | 5150 | - | 5925 | Yes | US | 2nd Harmonic, IMD4, IMD5 |
| 5150 | - | 5350 | Yes | Europe | IMD5 |
| 5470 | - | 5725 | Yes | IMD4 |
| 5150 | - | 5825 | Yes | Asia | 2nd Harmonic, IMD4, IMD5 |

The requirements for spurious emission band UE coexistence already exist in 38.101-3 for DC\_7\_n1.

### 5.17.3 ∆TIB and ∆RIB values

Table 5.17.3-1: ΔTIB,c

| Inter-band EN-DC configuration | ΔTIB,c for E-UTRA band / NR band (dB)6 | | |
| --- | --- | --- | --- |
| Component band in order of bands in configuration7 | | |
| DC\_1-7\_n1 | 0.5 | 0.6 | 0.5 |

### 5.17.4 Reference sensitivity exceptions

No additional requirements compared to fallbacks.

## 5.18 DC\_1-7\_n20

### 5.18.1 Configurations for DC

Table 5.18.1-1: Inter-band DC configurations (three bands)

| **EN-DC**  **configuration** | **Uplink EN-DC**  **configuration**  **(NOTE 1)** |
| --- | --- |
| DC\_1A-7A\_n20A | DC\_1A\_n20A  DC\_7A\_n20A |

### 5.18.2 Co-existence studies

Table 5.18.2-1 lists the Band 1A + Band n20A 2UL DC 2nd and 3rd order harmonics and 2nd, 3rd, 4th and 5th order IMD for the UE-to-UE coexistence analysis.

Table 5.18.2-1: Band 1 and Band n20 UL harmonics and IMD products

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **UE UL carriers** | **fx\_low** | **fx\_high** | | **fn\_low** | **fn\_high** | |
| UL frequency (MHz) | 1920 | 1980 | | 832 | 862 | |
| 2nd harmonics frequency limits | 2\*fx\_low | 2\*fx\_high | | 2\* fn\_low | 2\* fn\_high | |
| 2nd harmonics frequency limits (MHz) | 3840 – 3960 | | | 1664 – 1724 | | |
| 3rd harmonics frequency limits | 3\*fx\_low | | 3\*fx\_high | 3\* fn\_low | | 3\* fn\_high |
| 3rd harmonics frequency limits (MHz) | 5760 – 5940 | | | 2496 – 2586 | | |
| 2nd order IMD products | |fn\_low – fx\_high| | |fn\_high – fx\_low| | | |fn\_low + fx\_low| | |fn\_high + fx\_high| | |
| IMD frequency limits (MHz) | 1058 – 1148 | | | 2752 – 2842 | | |
| Two-tone 3rd order IMD products | |2\*fx\_low – fn\_high| | |2\*fx\_high – fn\_low| | | |2\*fn\_low – fx\_high| | |2\*fn\_high – fx\_low| | |
| IMD frequency limits (MHz) | 2978 – 3128 | | | 196 – 316 | | |
| Two-tone 3rd order IMD products | |2\*fx\_low + fn\_low| | |2\*fx\_high + fn\_high| | | |2\*fn\_low + fx\_low| | |2\*fn\_high + fx\_high| | |
| IMD frequency limits (MHz) | 4672 – 4822 | | | 3584 – 3704 | | |
| Two-tone 3rd order IMD products | (fx\_low – max BW fn) | | (fx\_high + max BW fn) | (fn\_low – max BW fx) | | (fn\_high + max BW fx) |
| IMD frequency limits (MHz) | 1900 – 2000 | | | 812 – 882 | | |
| Two-tone 4th order IMD products | |3\*fx\_low –1\* fn\_high| | | |3\*fx\_high – 1\*fn\_low| | |3\*fn\_low – 1\*fx\_high| | | |3\*fn\_high – 1\*fx\_low| |
| IMD frequency limits (MHz) | 4898 – 5108 | | | 516 – 666 | | |
| Two-tone 4th order IMD products | |2\*fx\_low –2\* fn\_high| | | |2\*fx\_high –2\* fn\_low| | |2\*fx\_low +2\* fn\_low| | | |2\*fx\_high +2\* fn\_high| |
| IMD frequency limits (MHz) | 2116 – 2296 | | | 5504 – 5684 | | |
| Two-tone 4th order IMD products | |3\*fx\_low +1\* fn\_low| | | |3\*fx\_high + 1\*fn\_high| | |3\*fn\_low + 1\*fx\_low| | | |3\*fn\_high + 1\*fx\_high| |
| IMD frequency limits (MHz) | 6592 – 6802 | | | 4416 – 4566 | | |
| Two-tone 5th order IMD products | |fx\_low – 4\*fn\_high| | | |fx\_high – 4\*fn\_low| | |fn\_low – 4\*fx\_high| | | |fn\_high – 4\*fx\_low| |
| IMD frequency limits (MHz) | 1348 – 1528 | | | 6818 – 7088 | | |
| Two-tone 5th order IMD products | |2\*fx\_low - 3\*fn\_high| | | |2\*fx\_high - 3\*fn\_low| | |2\*fn\_low - 3\*fx\_high| | | |2\*fn\_high -3\*fx\_low| |
| IMD frequency limits (MHz) | 1254 – 1464 | | | 4036 – 4276 | | |
| Two-tone 5th order IMD products | |fx\_low + 4\*fn\_low| | | |fx\_high + 4\*fn\_high| | |fn\_low + 4\*fx\_low| | | |fn\_high + 4\*fx\_high| |
| IMD frequency limits (MHz) | 5248 – 5428 | | | 8512 – 8782 | | |
| Two-tone 5th order IMD products | |2\*fx\_low + 3\*fn\_low| | | |2\*fx\_high + 3\*fn\_high| | |2\*fn\_low + 3\*fx\_low| | | |2\*fn\_high + 3\*fx\_high| |
| IMD frequency limits (MHz) | 6336 – 6546 | | | 7424 – 7664 | | |

Based on Table 5.18.2-1,

- 2nd order harmonics may fall into Rx frequencies of bands 46 and 47.

- 3rd order harmonics may fall into Rx frequencies of bands 38, 41, 69, 77 and 90.

- 3rd order IMD may fall into Rx frequencies of bands 22, 42, 43, 48, 49, 77, 78 and 79.

- 4th order IMD may fall into Rx frequencies of bands 1, 4, 10, 23, 46, 65, 66, 71 and 79.

- 5th order IMD may fall into Rx frequencies of bands 11, 21, 24, 32, 45, 46, 50, 51, 74, 75, 76, 77, 91, 92, 93 and 94.

When a 2UL inter-band DC UE is operating with other systems such as Wi-Fi, Bluetooth and GNSS, the harmonics and intermodulation products can have an impact on these systems. Table 5.18.2-2 lists if up to 3rd order harmonics and IMD up to 5th order falls into one of these receiving bands.

Table 5.18.2-2: 2UL Band 1 + Band n20 harmonic and IMD for ISM and GNSS bands

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Victim Systems** | **Frequency range [MHz]** | | | **Impact** | **Regions** | **Comments** |
| COMPASS  (Beidou) | 1559 | - | 1591 | No |  |  |
| Galileo | 1559 | - | 1591 | No |  |  |
| GLONASS | 1591 | - | 1610 | No |  |  |
| GPS | 1563 | - | 1587 | No |  |  |
| ISM band  (2.4GHz) | 2400 | - | 2483.5 | No | US/Europe |  |
| 2400 | - | 2494 | No | Asia |  |
| ISM band  (5GHz) | 5150 | - | 5925 | Yes | US | 2nd harmonic, IMD4, IMD5 |
| 5150 | - | 5350 | Yes | Europe | IMD5 |
| 5470 | - | 5725 | Yes | IMD4 |
| 5150 | - | 5825 | Yes | Asia | 2nd harmonic, IMD4, IMD5 |

The requirements for spurious emission band UE coexistence already exist in 38.101-3 for DC\_1\_n20.

Table 5.18.2-3 lists the Band 7A + Band n20A 2UL DC 2nd and 3rd order harmonics and 2nd, 3rd, 4th and 5th order IMD for the UE-to-UE coexistence analysis.

Table 5.18.2-3: Band 7 and Band n20 UL harmonics and IMD products

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **UE UL carriers** | **fx\_low** | **fx\_high** | | **fn\_low** | **fn\_high** | |
| UL frequency (MHz) | 2500 | 2570 | | 832 | 862 | |
| 2nd harmonics frequency limits | 2\*fx\_low | 2\*fx\_high | | 2\* fn\_low | 2\* fn\_high | |
| 2nd harmonics frequency limits (MHz) | 5000 – 5140 | | | 1664 – 1724 | | |
| 3rd harmonics frequency limits | 3\*fx\_low | | 3\*fx\_high | 3\* fn\_low | | 3\* fn\_high |
| 3rd harmonics frequency limits (MHz) | 7500 – 7710 | | | 2496 – 2586 | | |
| 2nd order IMD products | |fn\_low – fx\_high| | |fn\_high – fx\_low| | | |fn\_low + fx\_low| | |fn\_high + fx\_high| | |
| IMD frequency limits (MHz) | 1638 – 1738 | | | 3332 – 3432 | | |
| Two-tone 3rd order IMD products | |2\*fx\_low – fn\_high| | |2\*fx\_high – fn\_low| | | |2\*fn\_low – fx\_high| | |2\*fn\_high – fx\_low| | |
| IMD frequency limits (MHz) | 4138 – 4308 | | | 776 – 906 | | |
| Two-tone 3rd order IMD products | |2\*fx\_low + fn\_low| | |2\*fx\_high + fn\_high| | | |2\*fn\_low + fx\_low| | |2\*fn\_high + fx\_high| | |
| IMD frequency limits (MHz) | 5832 – 6002 | | | 4164 – 4294 | | |
| Two-tone 3rd order IMD products | (fx\_low – max BW fn) | | (fx\_high + max BW fn) | (fn\_low – max BW fx) | | (fn\_high + max BW fx) |
| IMD frequency limits (MHz) | 2480 – 2590 | | | 812 – 882 | | |
| Two-tone 4th order IMD products | |3\*fx\_low –1\* fn\_high| | | |3\*fx\_high – 1\*fn\_low| | |3\*fn\_low – 1\*fx\_high| | | |3\*fn\_high – 1\*fx\_low| |
| IMD frequency limits (MHz) | 6638 – 6878 | | | 74 – 86 | | |
| Two-tone 4th order IMD products | |2\*fx\_low –2\* fn\_high| | | |2\*fx\_high –2\* fn\_low| | |2\*fx\_low +2\* fn\_low| | | |2\*fx\_high +2\* fn\_high| |
| IMD frequency limits (MHz) | 3276 – 3476 | | | 6664 – 6864 | | |
| Two-tone 4th order IMD products | |3\*fx\_low +1\* fn\_low| | | |3\*fx\_high + 1\*fn\_high| | |3\*fn\_low + 1\*fx\_low| | | |3\*fn\_high + 1\*fx\_high| |
| IMD frequency limits (MHz) | 8332 – 8572 | | | 4996 – 5156 | | |
| Two-tone 5th order IMD products | |fx\_low – 4\*fn\_high| | | |fx\_high – 4\*fn\_low| | |fn\_low – 4\*fx\_high| | | |fn\_high – 4\*fx\_low| |
| IMD frequency limits (MHz) | 758 – 948 | | | 9138 – 9448 | | |
| Two-tone 5th order IMD products | |2\*fx\_low - 3\*fn\_high| | | |2\*fx\_high - 3\*fn\_low| | |2\*fn\_low - 3\*fx\_high| | | |2\*fn\_high -3\*fx\_low| |
| IMD frequency limits (MHz) | 2414 – 2644 | | | 5776 – 6046 | | |
| Two-tone 5th order IMD products | |fx\_low + 4\*fn\_low| | | |fx\_high + 4\*fn\_high| | |fn\_low + 4\*fx\_low| | | |fn\_high + 4\*fx\_high| |
| IMD frequency limits (MHz) | 5828 – 6018 | | | 10832 – 11142 | | |
| Two-tone 5th order IMD products | |2\*fx\_low + 3\*fn\_low| | | |2\*fx\_high + 3\*fn\_high| | |2\*fn\_low + 3\*fx\_low| | | |2\*fn\_high + 3\*fx\_high| |
| IMD frequency limits (MHz) | 7496 – 7726 | | | 9164 – 9434 | | |

Based on Table 5.18.2-3,

- 3rd order harmonics may fall into Rx frequencies of bands 38, 41, 69 and 90.

- 2nd order IMD may fall into Rx frequencies of bands 42, 52, 77 and 78.

- 3rd order IMD may fall into Rx frequencies of bands 5, 6, 18, 19, 20, 26, 27, 28, 44, 46, 47, 68 and 77.

- 4th order IMD may fall into Rx frequencies of bands 42, 46, 52, 77, 78 and 79.

- 5th order IMD may fall into Rx frequencies of bands 5, 6, 7, 8, 14, 18, 19, 20, 26, 27, 28, 38, 41, 44, 46, 47, 53, 68, 69 and 90.

When a 2UL inter-band DC UE is operating with other systems such as Wi-Fi, Bluetooth and GNSS, the harmonics and intermodulation products can have an impact on these systems. Table 5.18.2-4 lists if up to 3rd order harmonics and IMD up to 5th order falls into one of these receiving bands.

Table 5.18.2-4: 2UL Band 7 + Band n20 harmonic and IMD for ISM and GNSS bands

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Victim Systems** | **Frequency range [MHz]** | | | **Impact** | **Regions** | **Comments** |
| COMPASS  (Beidou) | 1559 | - | 1591 | No |  |  |
| Galileo | 1559 | - | 1591 | No |  |  |
| GLONASS | 1591 | - | 1610 | No |  |  |
| GPS | 1563 | - | 1587 | No |  |  |
| ISM band  (2.4GHz) | 2400 | - | 2483.5 | Yes | US/Europe | IMD5 |
| 2400 | - | 2494 | Yes | Asia | IMD5 |
| ISM band  (5GHz) | 5150 | - | 5925 | Yes | US | IMD3, IMD4, IMD5 |
| 5150 | - | 5350 | Yes | Europe | IMD4 |
| 5470 | - | 5725 | No |  |
| 5150 | - | 5825 | Yes | Asia | IMD4, IMD5 |

The requirements for spurious emission band UE coexistence already exist in 38.101-3 for DC\_7\_n20.

### 5.18.3 ∆TIB and ∆RIB values

Table 5.18.3-1: ΔTIB,c

| Inter-band EN-DC configuration | ΔTIB,c for E-UTRA band / NR band (dB)6 | | |
| --- | --- | --- | --- |
| Component band in order of bands in configuration7 | | |
| DC\_1-7\_n20 | 0.5 | 0.6 | 0.3 |

**Table 5.18.3-2: ΔRIB**

| **Inter-band EN-DC configuration** | ΔRIB,c for E-UTRA band / NR band (dB)7 | | |
| --- | --- | --- | --- |
| Component band in order of bands in configuration8 | | |
| DC\_1-7\_n20 | 0.2 | 0.1 | 0 |

### 5.18.4 Reference sensitivity exceptions

No additional exceptions required compared to fallbacks.

## 5.19 DC\_1-8\_n20

### 5.19.1 Configurations for DC

Table 5.19.1-1: Inter-band DC configurations (three bands)

| **EN-DC**  **configuration** | **Uplink EN-DC**  **configuration**  **(NOTE 1)** |
| --- | --- |
| DC\_1A-8A\_n20A | DC\_1A\_n20A  DC\_8A\_n20A |

### 5.19.2 Co-existence studies

Table 5.19.2-1 lists the Band 1A + Band n20A 2UL DC 2nd and 3rd order harmonics and 2nd, 3rd, 4th and 5th order IMD for the UE-to-UE coexistence analysis.

Table 5.19.2-1: Band 1 and Band n20 UL harmonics and IMD products

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **UE UL carriers** | **fx\_low** | **fx\_high** | | **fn\_low** | **fn\_high** | |
| UL frequency (MHz) | 1920 | 1980 | | 832 | 862 | |
| 2nd harmonics frequency limits | 2\*fx\_low | 2\*fx\_high | | 2\* fn\_low | 2\* fn\_high | |
| 2nd harmonics frequency limits (MHz) | 3840 – 3960 | | | 1664 – 1724 | | |
| 3rd harmonics frequency limits | 3\*fx\_low | | 3\*fx\_high | 3\* fn\_low | | 3\* fn\_high |
| 3rd harmonics frequency limits (MHz) | 5760 – 5940 | | | 2496 – 2586 | | |
| 2nd order IMD products | |fn\_low – fx\_high| | |fn\_high – fx\_low| | | |fn\_low + fx\_low| | |fn\_high + fx\_high| | |
| IMD frequency limits (MHz) | 1058 – 1148 | | | 2752 – 2842 | | |
| Two-tone 3rd order IMD products | |2\*fx\_low – fn\_high| | |2\*fx\_high – fn\_low| | | |2\*fn\_low – fx\_high| | |2\*fn\_high – fx\_low| | |
| IMD frequency limits (MHz) | 2978 – 3128 | | | 196 – 316 | | |
| Two-tone 3rd order IMD products | |2\*fx\_low + fn\_low| | |2\*fx\_high + fn\_high| | | |2\*fn\_low + fx\_low| | |2\*fn\_high + fx\_high| | |
| IMD frequency limits (MHz) | 4672 – 4822 | | | 3584 – 3704 | | |
| Two-tone 3rd order IMD products | (fx\_low – max BW fn) | | (fx\_high + max BW fn) | (fn\_low – max BW fx) | | (fn\_high + max BW fx) |
| IMD frequency limits (MHz) | 1900 – 2000 | | | 812 – 882 | | |
| Two-tone 4th order IMD products | |3\*fx\_low –1\* fn\_high| | | |3\*fx\_high – 1\*fn\_low| | |3\*fn\_low – 1\*fx\_high| | | |3\*fn\_high – 1\*fx\_low| |
| IMD frequency limits (MHz) | 4898 – 5108 | | | 516 – 666 | | |
| Two-tone 4th order IMD products | |2\*fx\_low –2\* fn\_high| | | |2\*fx\_high –2\* fn\_low| | |2\*fx\_low +2\* fn\_low| | | |2\*fx\_high +2\* fn\_high| |
| IMD frequency limits (MHz) | 2116 – 2296 | | | 5504 – 5684 | | |
| Two-tone 4th order IMD products | |3\*fx\_low +1\* fn\_low| | | |3\*fx\_high + 1\*fn\_high| | |3\*fn\_low + 1\*fx\_low| | | |3\*fn\_high + 1\*fx\_high| |
| IMD frequency limits (MHz) | 6592 – 6802 | | | 4416 – 4566 | | |
| Two-tone 5th order IMD products | |fx\_low – 4\*fn\_high| | | |fx\_high – 4\*fn\_low| | |fn\_low – 4\*fx\_high| | | |fn\_high – 4\*fx\_low| |
| IMD frequency limits (MHz) | 1348 – 1528 | | | 6818 – 7088 | | |
| Two-tone 5th order IMD products | |2\*fx\_low - 3\*fn\_high| | | |2\*fx\_high - 3\*fn\_low| | |2\*fn\_low - 3\*fx\_high| | | |2\*fn\_high -3\*fx\_low| |
| IMD frequency limits (MHz) | 1254 – 1464 | | | 4036 – 4276 | | |
| Two-tone 5th order IMD products | |fx\_low + 4\*fn\_low| | | |fx\_high + 4\*fn\_high| | |fn\_low + 4\*fx\_low| | | |fn\_high + 4\*fx\_high| |
| IMD frequency limits (MHz) | 5248 – 5428 | | | 8512 – 8782 | | |
| Two-tone 5th order IMD products | |2\*fx\_low + 3\*fn\_low| | | |2\*fx\_high + 3\*fn\_high| | |2\*fn\_low + 3\*fx\_low| | | |2\*fn\_high + 3\*fx\_high| |
| IMD frequency limits (MHz) | 6336 – 6546 | | | 7424 – 7664 | | |

Based on Table 5.19.2-1,

- 2nd order harmonics may fall into Rx frequencies of bands 46 and 47.

- 3rd order harmonics may fall into Rx frequencies of bands 38, 41, 69, 77 and 90.

- 3rd order IMD may fall into Rx frequencies of bands 22, 42, 43, 48, 49, 77, 78 and 79.

- 4th order IMD may fall into Rx frequencies of bands 1, 4, 10, 23, 46, 65, 66, 71 and 79.

- 5th order IMD may fall into Rx frequencies of bands 11, 21, 24, 32, 45, 46, 50, 51, 74, 75, 76, 77, 91, 92, 93 and 94.

When a 2UL inter-band DC UE is operating with other systems such as Wi-Fi, Bluetooth and GNSS, the harmonics and intermodulation products can have an impact on these systems. Table 5.19.2-2 lists if up to 3rd order harmonics and IMD up to 5th order falls into one of these receiving bands.

Table 5.19.2-2: 2UL Band 1 + Band n20 harmonic and IMD for ISM and GNSS bands

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Victim Systems** | **Frequency range [MHz]** | | | **Impact** | **Regions** | **Comments** |
| COMPASS  (Beidou) | 1559 | - | 1591 | No |  |  |
| Galileo | 1559 | - | 1591 | No |  |  |
| GLONASS | 1591 | - | 1610 | No |  |  |
| GPS | 1563 | - | 1587 | No |  |  |
| ISM band  (2.4GHz) | 2400 | - | 2483.5 | No | US/Europe |  |
| 2400 | - | 2494 | No | Asia |  |
| ISM band  (5GHz) | 5150 | - | 5925 | Yes | US | 2nd harmonic, IMD4, IMD5 |
| 5150 | - | 5350 | Yes | Europe | IMD5 |
| 5470 | - | 5725 | Yes | IMD4 |
| 5150 | - | 5825 | Yes | Asia | 2nd harmonic, IMD4, IMD5 |

The requirements for spurious emission band UE coexistence already exist in 38.101-3 for DC\_1\_n20.

Table 5.19.2-3 lists the Band 8A + Band n20A 2UL DC 2nd and 3rd order harmonics and 2nd, 3rd, 4th and 5th order IMD for the UE-to-UE coexistence analysis.

Table 5.19.2-3: Band 8 and Band n20 UL harmonics and IMD products

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **UE UL carriers** | **fx\_low** | **fx\_high** | | **fn\_low** | **fn\_high** | |
| UL frequency (MHz) | 880 | 915 | | 832 | 862 | |
| 2nd harmonics frequency limits | 2\*fx\_low | 2\*fx\_high | | 2\* fn\_low | 2\* fn\_high | |
| 2nd harmonics frequency limits (MHz) | 1760 – 1830 | | | 1664 – 1724 | | |
| 3rd harmonics frequency limits | 3\*fx\_low | | 3\*fx\_high | 3\* fn\_low | | 3\* fn\_high |
| 3rd harmonics frequency limits (MHz) | 2640 – 2745 | | | 2496 – 2586 | | |
| 2nd order IMD products | |fn\_low – fx\_high| | |fn\_high – fx\_low| | | |fn\_low + fx\_low| | |fn\_high + fx\_high| | |
| IMD frequency limits (MHz) | 18 – 83 | | | 1712 – 1777 | | |
| Two-tone 3rd order IMD products | |2\*fx\_low – fn\_high| | |2\*fx\_high – fn\_low| | | |2\*fn\_low – fx\_high| | |2\*fn\_high – fx\_low| | |
| IMD frequency limits (MHz) | 898 – 998 | | | 749 – 844 | | |
| Two-tone 3rd order IMD products | |2\*fx\_low + fn\_low| | |2\*fx\_high + fn\_high| | | |2\*fn\_low + fx\_low| | |2\*fn\_high + fx\_high| | |
| IMD frequency limits (MHz) | 2592 – 2692 | | | 2544 – 2639 | | |
| Two-tone 3rd order IMD products | (fx\_low – max BW fn) | | (fx\_high + max BW fn) | (fn\_low – max BW fx) | | (fn\_high + max BW fx) |
| IMD frequency limits (MHz) | 860 – 935 | | | 822 – 872 | | |
| Two-tone 4th order IMD products | |3\*fx\_low –1\* fn\_high| | | |3\*fx\_high – 1\*fn\_low| | |3\*fn\_low – 1\*fx\_high| | | |3\*fn\_high – 1\*fx\_low| |
| IMD frequency limits (MHz) | 1778 – 1913 | | | 1581 – 1706 | | |
| Two-tone 4th order IMD products | |2\*fx\_low –2\* fn\_high| | | |2\*fx\_high –2\* fn\_low| | |2\*fx\_low +2\* fn\_low| | | |2\*fx\_high +2\* fn\_high| |
| IMD frequency limits (MHz) | 36 – 166 | | | 3424 – 3554 | | |
| Two-tone 4th order IMD products | |3\*fx\_low +1\* fn\_low| | | |3\*fx\_high + 1\*fn\_high| | |3\*fn\_low + 1\*fx\_low| | | |3\*fn\_high + 1\*fx\_high| |
| IMD frequency limits (MHz) | 3472 – 3607 | | | 3376 – 3501 | | |
| Two-tone 5th order IMD products | |fx\_low – 4\*fn\_high| | | |fx\_high – 4\*fn\_low| | |fn\_low – 4\*fx\_high| | | |fn\_high – 4\*fx\_low| |
| IMD frequency limits (MHz) | 2413 – 2568 | | | 2658 – 2828 | | |
| Two-tone 5th order IMD products | |2\*fx\_low - 3\*fn\_high| | | |2\*fx\_high - 3\*fn\_low| | |2\*fn\_low - 3\*fx\_high| | | |2\*fn\_high -3\*fx\_low| |
| IMD frequency limits (MHz) | 666 – 826 | | | 916 – 1081 | | |
| Two-tone 5th order IMD products | |fx\_low + 4\*fn\_low| | | |fx\_high + 4\*fn\_high| | |fn\_low + 4\*fx\_low| | | |fn\_high + 4\*fx\_high| |
| IMD frequency limits (MHz) | 4208 – 4363 | | | 4352 – 4522 | | |
| Two-tone 5th order IMD products | |2\*fx\_low + 3\*fn\_low| | | |2\*fx\_high + 3\*fn\_high| | |2\*fn\_low + 3\*fx\_low| | | |2\*fn\_high + 3\*fx\_high| |
| IMD frequency limits (MHz) | 4256 – 4416 | | | 4304 – 4469 | | |

Based on Table 5.19.2-3,

- 2nd order harmonics may fall into Rx frequencies of bands 7, 41 and 90.

- 3rd order harmonics may fall into Rx frequencies of bands 3, 38, 41, 69 and 90.

- 3rd order IMD may fall into Rx frequencies of bands 7, 8, 13, 14, 20, 28, 38, 38, 41, 44, 67, 68, 69 and 90.

- 4th order IMD may fall into Rx frequencies of bands 3, 9, 22, 33, 35, 37, 39, 42, 43, 48, 49, 52, 77 and 78.

- 5th order IMD may fall into Rx frequencies of bands 7, 8, 12, 13, 14, 17, 20, 28, 29, 41, 44, 53, 67, 68, 79, 85 and 90.

When a 2UL inter-band DC UE is operating with other systems such as Wi-Fi, Bluetooth and GNSS, the harmonics and intermodulation products can have an impact on these systems. Table 5.19.2-4 lists if up to 3rd order harmonics and IMD up to 5th order falls into one of these receiving bands.

Table 5.19.2-4: 2UL Band 8 + Band n20 harmonic and IMD for ISM and GNSS bands

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Victim Systems** | **Frequency range [MHz]** | | | **Impact** | **Regions** | **Comments** |
| COMPASS  (Beidou) | 1559 | - | 1591 | Yes |  | IMD4 |
| Galileo | 1559 | - | 1591 | Yes |  | IMD4 |
| GLONASS | 1591 | - | 1610 | Yes |  | IMD4 |
| GPS | 1563 | - | 1587 | Yes |  | IMD4 |
| ISM band  (2.4GHz) | 2400 | - | 2483.5 | Yes | US/Europe | IMD5 |
| 2400 | - | 2494 | Yes | Asia | IMD5 |
| ISM band  (5GHz) | 5150 | - | 5925 | No | US |  |
| 5150 | - | 5350 | No | Europe |  |
| 5470 | - | 5725 | No |  |
| 5150 | - | 5825 | No | Asia |  |

The requirements for spurious emission band UE coexistence already exist in 38.101-3 for DC\_8\_n20.

### 5.19.3 ∆TIB and ∆RIB values

Table 5.19.3-1: ΔTIB,c

| Inter-band EN-DC configuration | ΔTIB,c for E-UTRA band / NR band (dB)6 | | |
| --- | --- | --- | --- |
| Component band in order of bands in configuration7 | | |
| DC\_1-8\_n20 | 0.3 | 0.4 | 0.4 |

### 5.19.4 Reference sensitivity exceptions

No additional exceptions required compared to fallbacks.

## 5.20 DC\_3-20\_n3

### 5.20.1 Configurations for DC

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

| **EN-DC**  **configuration** | **Uplink EN-DC**  **configuration**  **(NOTE 1)** |
| --- | --- |
| DC\_3A-20A\_n3A | DC\_3A\_n3A2  DC\_20A\_n3A |
| NOTE 2: Only single switched UL is supported | |

### 5.20.2 Co-existence studies

Table 5.20.2-1 lists the Band 20A + Band n3A 2UL DC 2nd and 3rd order harmonics and 2nd, 3rd, 4th and 5th order IMD for the UE-to-UE coexistence analysis.

Table 5.20.2-1: Band 20 and Band n3 UL harmonics and IMD products

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **UE UL carriers** | **fx\_low** | **fx\_high** | | **fn\_low** | **fn\_high** | |
| UL frequency (MHz) | 832 | 862 | | 1710 | 1785 | |
| 2nd harmonics frequency limits | 2\*fx\_low | 2\*fx\_high | | 2\* fn\_low | 2\* fn\_high | |
| 2nd harmonics frequency limits (MHz) | 1664 – 1724 | | | 3420 – 3570 | | |
| 3rd harmonics frequency limits | 3\*fx\_low | | 3\*fx\_high | 3\* fn\_low | | 3\* fn\_high |
| 3rd harmonics frequency limits (MHz) | 2496 – 2586 | | | 5130 – 5355 | | |
| 2nd order IMD products | |fn\_low – fx\_high| | |fn\_high – fx\_low| | | |fn\_low + fx\_low| | |fn\_high + fx\_high| | |
| IMD frequency limits (MHz) | 848 – 953 | | | 2542 – 2647 | | |
| Two-tone 3rd order IMD products | |2\*fx\_low – fn\_high| | |2\*fx\_high – fn\_low| | | |2\*fn\_low – fx\_high| | |2\*fn\_high – fx\_low| | |
| IMD frequency limits (MHz) | 14 – 121 | | | 2558 – 2738 | | |
| Two-tone 3rd order IMD products | |2\*fx\_low + fn\_low| | |2\*fx\_high + fn\_high| | | |2\*fn\_low + fx\_low| | |2\*fn\_high + fx\_high| | |
| IMD frequency limits (MHz) | 3374 – 3509 | | | 4252 – 4432 | | |
| Two-tone 3rd order IMD products | (fx\_low – max BW fn) | | (fx\_high + max BW fn) | (fn\_low – max BW fx) | | (fn\_high + max BW fx) |
| IMD frequency limits (MHz) | 802 – 892 | | | 1690 – 1805 | | |
| Two-tone 4th order IMD products | |3\*fx\_low –1\* fn\_high| | | |3\*fx\_high – 1\*fn\_low| | |3\*fn\_low – 1\*fx\_high| | | |3\*fn\_high – 1\*fx\_low| |
| IMD frequency limits (MHz) | 711 – 876 | | | 4268 – 4523 | | |
| Two-tone 4th order IMD products | |2\*fx\_low –2\* fn\_high| | | |2\*fx\_high –2\* fn\_low| | |2\*fx\_low +2\* fn\_low| | | |2\*fx\_high +2\* fn\_high| |
| IMD frequency limits (MHz) | 1696 – 1906 | | | 5084 – 5294 | | |
| Two-tone 4th order IMD products | |3\*fx\_low +1\* fn\_low| | | |3\*fx\_high + 1\*fn\_high| | |3\*fn\_low + 1\*fx\_low| | | |3\*fn\_high + 1\*fx\_high| |
| IMD frequency limits (MHz) | 4206 – 4371 | | | 5962 – 6217 | | |
| Two-tone 5th order IMD products | |fx\_low – 4\*fn\_high| | | |fx\_high – 4\*fn\_low| | |fn\_low – 4\*fx\_high| | | |fn\_high – 4\*fx\_low| |
| IMD frequency limits (MHz) | 5978 – 6308 | | | 1543 – 1738 | | |
| Two-tone 5th order IMD products | |2\*fx\_low - 3\*fn\_high| | | |2\*fx\_high - 3\*fn\_low| | |2\*fn\_low - 3\*fx\_high| | | |2\*fn\_high -3\*fx\_low| |
| IMD frequency limits (MHz) | 3406 – 3691 | | | 834 – 1074 | | |
| Two-tone 5th order IMD products | |fx\_low + 4\*fn\_low| | | |fx\_high + 4\*fn\_high| | |fn\_low + 4\*fx\_low| | | |fn\_high + 4\*fx\_high| |
| IMD frequency limits (MHz) | 7672 – 8002 | | | 5038 – 5233 | | |
| Two-tone 5th order IMD products | |2\*fx\_low + 3\*fn\_low| | | |2\*fx\_high + 3\*fn\_high| | |2\*fn\_low + 3\*fx\_low| | | |2\*fn\_high + 3\*fx\_high| |
| IMD frequency limits (MHz) | 6794 – 7079 | | | 5916 – 6156 | | |

Based on Table 5.20.2-1,

- 2nd order harmonics may fall into Rx frequencies of band 46.

- 3rd order harmonics may fall into Rx frequencies of bands 22, 38, 41, 42, 48, 49, 69, 77, 78 and 90.

- 2nd order IMD may fall into Rx frequencies of bands 5, 6, 7, 8, 18, 19, 26, 27, 38, 41, 69 and 90.

- 3rd order IMD may fall into Rx frequencies of bands 7, 38, 41, 42, 52, 69, 77, 78, 79 and 90.

- 4th order IMD may fall into Rx frequencies of bands 3, 5, 6, 9, 12, 13, 14, 17, 18, 19, 20, 26, 27, 28, 29, 33, 35, 39, 44, 46, 67, 68, 79 and 85.

- 5th order IMD may fall into Rx frequencies of bands 5, 6, 8, 18, 19, 22, 24, 26, 27, 42, 43, 46, 47, 48, 49, 77 and 78.

When a 2UL inter-band DC UE is operating with other systems such as Wi-Fi, Bluetooth and GNSS, the harmonics and intermodulation products can have an impact on these systems. Table 5.20.2-2 lists if up to 3rd order harmonics and IMD up to 5th order falls into one of these receiving bands.

Table 5.20.2-2: 2UL Band 20 + Band n3 harmonic and IMD for ISM and GNSS bands

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Victim Systems** | **Frequency range [MHz]** | | | **Impact** | **Regions** | **Comments** |
| COMPASS  (Beidou) | 1559 | - | 1591 | Yes |  | IMD5 |
| Galileo | 1559 | - | 1591 | Yes |  | IMD5 |
| GLONASS | 1591 | - | 1610 | Yes |  | IMD5 |
| GPS | 1563 | - | 1587 | Yes |  | IMD5 |
| ISM band  (2.4GHz) | 2400 | - | 2483.5 | No | US/Europe |  |
| 2400 | - | 2494 | No | Asia |  |
| ISM band  (5GHz) | 5150 | - | 5925 | Yes | US | 2nd Harmonic, IMD4, IMD5 |
| 5150 | - | 5350 | Yes | Europe | 2nd Harmonic, IMD4, IMD5 |
| 5470 | - | 5725 | No |  |
| 5150 | - | 5825 | Yes | Asia | 2nd Harmonic, IMD4, IMD5 |

The requirements for spurious emission band UE coexistence already exist in 38.101-3 for DC\_20\_n3.

### 5.20.3 ∆TIB and ∆RIB values

Table 5.20.3-1: ΔTIB,c

| Inter-band EN-DC configuration | ΔTIB,c for E-UTRA band / NR band (dB)6 | | |
| --- | --- | --- | --- |
| Component band in order of bands in configuration7 | | |
| DC\_3-20\_n3 | 0.3 | 0.3 | 0.3 |

### 5.20.4 Reference sensitivity exceptions

Table 5.204-1: 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-20A\_n3A | 3 | 1775 | 5 | 25 | 1870 | 4 | IMD4 |
| 20 | 835 | 5 | 25 | 794 | N/A | N/A |
| n3 | 1765 | 5 | 25 | 1860 | N/A | N/A |

## 5.21 DC\_3-32\_n7

### 5.21.1 Configurations for DC

Table 5.21.1-1: Inter-band DC configurations (three bands)

| **EN-DC**  **configuration** | **Uplink EN-DC**  **configuration**  **(NOTE 1)** |
| --- | --- |
| DC\_3A-32A\_n7A | DC\_3A\_n7A |

### 5.21.2 Co-existence studies

Table 5.21.2-1 lists the Band 3A + Band n7A 2UL DC 2nd and 3rd order harmonics and 2nd, 3rd, 4th and 5th order IMD for the UE-to-UE coexistence analysis.

Table 5.21.2-1: Band 3 and Band n7 UL harmonics and IMD products

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **UE UL carriers** | **fx\_low** | **fx\_high** | | **fn\_low** | **fn\_high** | |
| UL frequency (MHz) | 1710 | 1785 | | 2500 | 2570 | |
| 2nd harmonics frequency limits | 2\*fx\_low | 2\*fx\_high | | 2\* fn\_low | 2\* fn\_high | |
| 2nd harmonics frequency limits (MHz) | 3420 – 3570 | | | 5000 – 5140 | | |
| 3rd harmonics frequency limits | 3\*fx\_low | | 3\*fx\_high | 3\* fn\_low | | 3\* fn\_high |
| 3rd harmonics frequency limits (MHz) | 5130 – 5355 | | | 7500 – 7710 | | |
| 2nd order IMD products | |fn\_low – fx\_high| | |fn\_high – fx\_low| | | |fn\_low + fx\_low| | |fn\_high + fx\_high| | |
| IMD frequency limits (MHz) | 715 – 860 | | | 4210 – 4355 | | |
| Two-tone 3rd order IMD products | |2\*fx\_low – fn\_high| | |2\*fx\_high – fn\_low| | | |2\*fn\_low – fx\_high| | |2\*fn\_high – fx\_low| | |
| IMD frequency limits (MHz) | 850 – 1070 | | | 3215 – 3430 | | |
| Two-tone 3rd order IMD products | |2\*fx\_low + fn\_low| | |2\*fx\_high + fn\_high| | | |2\*fn\_low + fx\_low| | |2\*fn\_high + fx\_high| | |
| IMD frequency limits (MHz) | 5920 – 6140 | | | 6710 – 6925 | | |
| Two-tone 3rd order IMD products | (fx\_low – max BW fn) | | (fx\_high + max BW fn) | (fn\_low – max BW fx) | | (fn\_high + max BW fx) |
| IMD frequency limits (MHz) | 1660 – 1835 | | | 2480 – 2590 | | |
| Two-tone 4th order IMD products | |3\*fx\_low –1\* fn\_high| | | |3\*fx\_high – 1\*fn\_low| | |3\*fn\_low – 1\*fx\_high| | | |3\*fn\_high – 1\*fx\_low| |
| IMD frequency limits (MHz) | 2560 – 2855 | | | 5715 – 6000 | | |
| Two-tone 4th order IMD products | |2\*fx\_low –2\* fn\_high| | | |2\*fx\_high –2\* fn\_low| | |2\*fx\_low +2\* fn\_low| | | |2\*fx\_high +2\* fn\_high| |
| IMD frequency limits (MHz) | 1430 – 1720 | | | 8420 – 8710 | | |
| Two-tone 4th order IMD products | |3\*fx\_low +1\* fn\_low| | | |3\*fx\_high + 1\*fn\_high| | |3\*fn\_low + 1\*fx\_low| | | |3\*fn\_high + 1\*fx\_high| |
| IMD frequency limits (MHz) | 7630 – 7925 | | | 9210 – 9495 | | |
| Two-tone 5th order IMD products | |fx\_low – 4\*fn\_high| | | |fx\_high – 4\*fn\_low| | |fn\_low – 4\*fx\_high| | | |fn\_high – 4\*fx\_low| |
| IMD frequency limits (MHz) | 8215 – 8570 | | | 4270 – 4640 | | |
| Two-tone 5th order IMD products | |2\*fx\_low - 3\*fn\_high| | | |2\*fx\_high - 3\*fn\_low| | |2\*fn\_low - 3\*fx\_high| | | |2\*fn\_high -3\*fx\_low| |
| IMD frequency limits (MHz) | 3930 – 4290 | | | 10 – 355 | | |
| Two-tone 5th order IMD products | |fx\_low + 4\*fn\_low| | | |fx\_high + 4\*fn\_high| | |fn\_low + 4\*fx\_low| | | |fn\_high + 4\*fx\_high| |
| IMD frequency limits (MHz) | 11710 – 12065 | | | 9340 – 9710 | | |
| Two-tone 5th order IMD products | |2\*fx\_low + 3\*fn\_low| | | |2\*fx\_high + 3\*fn\_high| | |2\*fn\_low + 3\*fx\_low| | | |2\*fn\_high + 3\*fx\_high| |
| IMD frequency limits (MHz) | 10920 – 11280 | | | 10130 – 10495 | | |

Based on Table 5.21.2-1,

- 2nd order harmonics may fall into Rx frequencies of band 46.

- 3rd order harmonics may fall into Rx frequencies of bands 22, 42, 48, 49, 77 and 78.

- 2nd order IMD may fall into Rx frequencies of bands 12, 13, 14, 17, 20, 26, 27, 28, 29, 44, 67, 68 and 85.

- 3rd order IMD may fall into Rx frequencies of bands 5, 6, 8, 18, 19, 26, 27, 42, 46, 47, 52, 77 and 78.

- 4th order IMD may fall into Rx frequencies of bands 7, 11, 21, 24, 32, 38, 41, 45, 46, 47, 50, 51, 69, 74, 75, 76, 90, 91, 92, 93 and 94.

- 5th order IMD may fall into Rx frequencies of bands 77 and 79.

When a 2UL inter-band DC UE is operating with other systems such as Wi-Fi, Bluetooth and GNSS, the harmonics and intermodulation products can have an impact on these systems. Table 5.21.2-2 lists if up to 3rd order harmonics and IMD up to 5th order falls into one of these receiving bands.

Table 5.21.2-2: 2UL Band 3 + Band n7 harmonic and IMD for ISM and GNSS bands

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Victim Systems** | **Frequency range [MHz]** | | | **Impact** | **Regions** | **Comments** |
| COMPASS  (Beidou) | 1559 | - | 1591 | Yes |  | IMD4 |
| Galileo | 1559 | - | 1591 | Yes |  | IMD4 |
| GLONASS | 1591 | - | 1610 | Yes |  | IMD4 |
| GPS | 1563 | - | 1587 | Yes |  | IMD4 |
| ISM band  (2.4GHz) | 2400 | - | 2483.5 | No | US/Europe |  |
| 2400 | - | 2494 | No | Asia |  |
| ISM band  (5GHz) | 5150 | - | 5925 | Yes | US | 2nd harmonic, IMD3, IMD4 |
| 5150 | - | 5350 | Yes | Europe | 2nd harmonic |
| 5470 | - | 5725 | Yes | IMD4 |
| 5150 | - | 5825 | Yes | Asia | 2nd harmonic, IMD4 |

The requirements for spurious emission band UE coexistence already exist in 38.101-3 for DC\_3\_n7.

### 5.21.3 ∆TIB and ∆RIB values

Table 5.21.3-1: ΔTIB,c

| Inter-band EN-DC configuration | ΔTIB,c for E-UTRA band / NR band (dB)6 | | |
| --- | --- | --- | --- |
| Component band in order of bands in configuration7 | | |
| DC\_3-32\_n7 | 0.7 | 0 | 0.7 |

### 5.21.4 Reference sensitivity exceptions

Table 5.21.4-1: 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-32A\_n7A | 3 | 1775 | 5 | 25 | 1870 | N/A | N/A |
| 32 | N/A | N/A | N/A | 1470 | 10.5 | IMD4 |
| n7 | 2510 | 10 | 50 | 2630 | N/A | N/A |

## 5.22 DC\_8-28\_n3

### 5.22.1 Configurations for DC

Table 5.22.1-1: Inter-band DC configurations (three bands)

| **EN-DC**  **configuration** | **Uplink EN-DC**  **configuration**  **(NOTE 1)** |
| --- | --- |
| DC\_8A-28A\_n3A | DC\_8A\_n3A  DC\_28A\_n3A |

### 5.22.2 Co-existence studies

Table 5.22.2-1 lists the Band 8A + Band n3A 2UL DC 2nd and 3rd order harmonics and 2nd, 3rd, 4th and 5th order IMD for the UE-to-UE coexistence analysis.

Table 5.22.2-1: Band 8 and Band n3 UL harmonics and IMD products

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **UE UL carriers** | **fx\_low** | **fx\_high** | | **fn\_low** | **fn\_high** | |
| UL frequency (MHz) | 880 | 915 | | 1710 | 1785 | |
| 2nd harmonics frequency limits | 2\*fx\_low | 2\*fx\_high | | 2\* fn\_low | 2\* fn\_high | |
| 2nd harmonics frequency limits (MHz) | 1760 – 1830 | | | 3420 – 3570 | | |
| 3rd harmonics frequency limits | 3\*fx\_low | | 3\*fx\_high | 3\* fn\_low | | 3\* fn\_high |
| 3rd harmonics frequency limits (MHz) | 2640 – 2745 | | | 5130 – 5355 | | |
| 2nd order IMD products | |fn\_low – fx\_high| | |fn\_high – fx\_low| | | |fn\_low + fx\_low| | |fn\_high + fx\_high| | |
| IMD frequency limits (MHz) | 795 – 905 | | | 2590 – 2700 | | |
| Two-tone 3rd order IMD products | |2\*fx\_low – fn\_high| | |2\*fx\_high – fn\_low| | | |2\*fn\_low – fx\_high| | |2\*fn\_high – fx\_low| | |
| IMD frequency limits (MHz) | 25 – 120 | | | 2505 – 2690 | | |
| Two-tone 3rd order IMD products | |2\*fx\_low + fn\_low| | |2\*fx\_high + fn\_high| | | |2\*fn\_low + fx\_low| | |2\*fn\_high + fx\_high| | |
| IMD frequency limits (MHz) | 3470 – 3615 | | | 4300 – 4485 | | |
| Two-tone 3rd order IMD products | (fx\_low – max BW fn) | | (fx\_high + max BW fn) | (fn\_low – max BW fx) | | (fn\_high + max BW fx) |
| IMD frequency limits (MHz) | 850 – 945 | | | 1700 – 1795 | | |
| Two-tone 4th order IMD products | |3\*fx\_low –1\* fn\_high| | | |3\*fx\_high – 1\*fn\_low| | |3\*fn\_low – 1\*fx\_high| | | |3\*fn\_high – 1\*fx\_low| |
| IMD frequency limits (MHz) | 855 – 1035 | | | 4215 – 4475 | | |
| Two-tone 4th order IMD products | |2\*fx\_low –2\* fn\_high| | | |2\*fx\_high –2\* fn\_low| | |2\*fx\_low +2\* fn\_low| | | |2\*fx\_high +2\* fn\_high| |
| IMD frequency limits (MHz) | 1590 – 1810 | | | 5180 – 5400 | | |
| Two-tone 4th order IMD products | |3\*fx\_low +1\* fn\_low| | | |3\*fx\_high + 1\*fn\_high| | |3\*fn\_low + 1\*fx\_low| | | |3\*fn\_high + 1\*fx\_high| |
| IMD frequency limits (MHz) | 4350 – 4530 | | | 6010 – 6270 | | |
| Two-tone 5th order IMD products | |fx\_low – 4\*fn\_high| | | |fx\_high – 4\*fn\_low| | |fn\_low – 4\*fx\_high| | | |fn\_high – 4\*fx\_low| |
| IMD frequency limits (MHz) | 5925 – 6260 | | | 1735 – 1950 | | |
| Two-tone 5th order IMD products | |2\*fx\_low - 3\*fn\_high| | | |2\*fx\_high - 3\*fn\_low| | |2\*fn\_low - 3\*fx\_high| | | |2\*fn\_high -3\*fx\_low| |
| IMD frequency limits (MHz) | 3300 – 3595 | | | 675 – 930 | | |
| Two-tone 5th order IMD products | |fx\_low + 4\*fn\_low| | | |fx\_high + 4\*fn\_high| | |fn\_low + 4\*fx\_low| | | |fn\_high + 4\*fx\_high| |
| IMD frequency limits (MHz) | 7720 – 8055 | | | 5230 – 5445 | | |
| Two-tone 5th order IMD products | |2\*fx\_low + 3\*fn\_low| | | |2\*fx\_high + 3\*fn\_high| | |2\*fn\_low + 3\*fx\_low| | | |2\*fn\_high + 3\*fx\_high| |
| IMD frequency limits (MHz) | 6890 – 7185 | | | 6060 – 6315 | | |

Based on Table 5.22.2-1,

- 2nd order harmonics may fall into Rx frequencies of bands 3 and 46.

- 3rd order harmonics may fall into Rx frequencies of bands 7, 22, 41, 42, 48, 49, 77, 78 and 90.

- 2nd order IMD may fall into Rx frequencies of bands 5, 6, 7, 18, 19, 20, 26, 27, 28, 38, 41, 44, 69 and 90.

- 3rd order IMD may fall into Rx frequencies of bands 7, 22, 38, 41, 42, 43, 48, 49, 69, 77, 78, 79 and 90.

- 4th order IMD may fall into Rx frequencies of bands 3, 5, 6, 8, 18, 19, 26, 27, 46 and 79.

- 5th order IMD may fall into Rx frequencies of bands 2, 3, 5, 6, 8, 9, 12, 13, 14, 17, 18, 19, 20, 22, 25, 26, 27, 28, 29, 33, 35, 36, 37, 39, 42, 44, 46, 48, 49, 52, 67, 68, 77, 78 and 85.

When a 2UL inter-band DC UE is operating with other systems such as Wi-Fi, Bluetooth and GNSS, the harmonics and intermodulation products can have an impact on these systems. Table 5.22.2-2 lists if up to 3rd order harmonics and IMD up to 5th order falls into one of these receiving bands.

Table 5.22.2-2: 2UL Band 8 + Band n3 harmonic and IMD for ISM and GNSS bands

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Victim Systems** | **Frequency range [MHz]** | | | **Impact** | **Regions** | **Comments** |
| COMPASS  (Beidou) | 1559 | - | 1591 | Yes |  | IMD4 |
| Galileo | 1559 | - | 1591 | Yes |  | IMD4 |
| GLONASS | 1591 | - | 1610 | Yes |  | IMD4 |
| GPS | 1563 | - | 1587 | No |  |  |
| ISM band  (2.4GHz) | 2400 | - | 2483.5 | No | US/Europe |  |
| 2400 | - | 2494 | No | Asia |  |
| ISM band  (5GHz) | 5150 | - | 5925 | Yes | US | 2nd harmonic, IMD4, IMD5 |
| 5150 | - | 5350 | Yes | Europe | 2nd harmonic, IMD4, IMD5 |
| 5470 | - | 5725 | No |  |
| 5150 | - | 5825 | Yes | Asia | 2nd harmonic, IMD4, IMD5 |

The requirements for spurious emission band UE coexistence already exist in 38.101-3 for DC\_8\_n3.

Table 5.22.2-3 lists the Band 28A + Band n3A 2UL DC 2nd and 3rd order harmonics and 2nd, 3rd, 4th and 5th order IMD for the UE-to-UE coexistence analysis.

Table 5.22.2-3: Band 28 and Band n3 UL harmonics and IMD products

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **UE UL carriers** | **fx\_low** | **fx\_high** | | **fn\_low** | **fn\_high** | |
| UL frequency (MHz) | 703 | 748 | | 1710 | 1785 | |
| 2nd harmonics frequency limits | 2\*fx\_low | 2\*fx\_high | | 2\* fn\_low | 2\* fn\_high | |
| 2nd harmonics frequency limits (MHz) | 1406 – 1496 | | | 3420 – 3570 | | |
| 3rd harmonics frequency limits | 3\*fx\_low | | 3\*fx\_high | 3\* fn\_low | | 3\* fn\_high |
| 3rd harmonics frequency limits (MHz) | 2109 – 2244 | | | 5130 – 5355 | | |
| 2nd order IMD products | |fn\_low – fx\_high| | |fn\_high – fx\_low| | | |fn\_low + fx\_low| | |fn\_high + fx\_high| | |
| IMD frequency limits (MHz) | 962 – 1082 | | | 2413 – 2533 | | |
| Two-tone 3rd order IMD products | |2\*fx\_low – fn\_high| | |2\*fx\_high – fn\_low| | | |2\*fn\_low – fx\_high| | |2\*fn\_high – fx\_low| | |
| IMD frequency limits (MHz) | 214 – 379 | | | 2672 – 2867 | | |
| Two-tone 3rd order IMD products | |2\*fx\_low + fn\_low| | |2\*fx\_high + fn\_high| | | |2\*fn\_low + fx\_low| | |2\*fn\_high + fx\_high| | |
| IMD frequency limits (MHz) | 3116 – 3281 | | | 4123 – 4318 | | |
| Two-tone 3rd order IMD products | (fx\_low – max BW fn) | | (fx\_high + max BW fn) | (fn\_low – max BW fx) | | (fn\_high + max BW fx) |
| IMD frequency limits (MHz) | 673 – 778 | | | 1690 – 1805 | | |
| Two-tone 4th order IMD products | |3\*fx\_low –1\* fn\_high| | | |3\*fx\_high – 1\*fn\_low| | |3\*fn\_low – 1\*fx\_high| | | |3\*fn\_high – 1\*fx\_low| |
| IMD frequency limits (MHz) | 324 – 534 | | | 4382 – 4652 | | |
| Two-tone 4th order IMD products | |2\*fx\_low –2\* fn\_high| | | |2\*fx\_high –2\* fn\_low| | |2\*fx\_low +2\* fn\_low| | | |2\*fx\_high +2\* fn\_high| |
| IMD frequency limits (MHz) | 1924 – 2164 | | | 4826 – 5066 | | |
| Two-tone 4th order IMD products | |3\*fx\_low +1\* fn\_low| | | |3\*fx\_high + 1\*fn\_high| | |3\*fn\_low + 1\*fx\_low| | | |3\*fn\_high + 1\*fx\_high| |
| IMD frequency limits (MHz) | 3819 – 4029 | | | 5833 – 6103 | | |
| Two-tone 5th order IMD products | |fx\_low – 4\*fn\_high| | | |fx\_high – 4\*fn\_low| | |fn\_low – 4\*fx\_high| | | |fn\_high – 4\*fx\_low| |
| IMD frequency limits (MHz) | 6092 – 6437 | | | 1027 – 1282 | | |
| Two-tone 5th order IMD products | |2\*fx\_low - 3\*fn\_high| | | |2\*fx\_high - 3\*fn\_low| | |2\*fn\_low - 3\*fx\_high| | | |2\*fn\_high -3\*fx\_low| |
| IMD frequency limits (MHz) | 3634 – 3949 | | | 1176 – 1461 | | |
| Two-tone 5th order IMD products | |fx\_low + 4\*fn\_low| | | |fx\_high + 4\*fn\_high| | |fn\_low + 4\*fx\_low| | | |fn\_high + 4\*fx\_high| |
| IMD frequency limits (MHz) | 7543 – 7888 | | | 4522 – 4777 | | |
| Two-tone 5th order IMD products | |2\*fx\_low + 3\*fn\_low| | | |2\*fx\_high + 3\*fn\_high| | |2\*fn\_low + 3\*fx\_low| | | |2\*fn\_high + 3\*fx\_high| |
| IMD frequency limits (MHz) | 6536 – 6851 | | | 5529 – 5814 | | |

Based on Table 5.22.2-3,

- 2nd order harmonics may fall into Rx frequencies of bands 11, 21, 32, 45, 46, 50, 51, 74, 75, 76, 91, 92, 93 and 94.

- 3rd order harmonics may fall into Rx frequencies of bands 1, 4, 10, 22, 23, 42, 48, 49, 65, 66, 77 and 78.

- 2nd order IMD may fall into Rx frequencies of bands 41, 53 and 90.

- 3rd order IMD may fall into Rx frequencies of bands 7, 41, 77 and 90.

- 4th order IMD may fall into Rx frequencies of bands 1, 2, 4, 10, 25, 31, 34, 36, 37, 46, 47, 65, 66, 70, 72, 73, 77, 79, 87 and 88.

- 5th order IMD may fall into Rx frequencies of bands 32, 43, 45, 46, 48, 49, 50, 51, 75, 76, 77, 78, 79, 91, 92, 93 and 94.

When a 2UL inter-band DC UE is operating with other systems such as Wi-Fi, Bluetooth and GNSS, the harmonics and intermodulation products can have an impact on these systems. Table 5.22.2-4 lists if up to 3rd order harmonics and IMD up to 5th order falls into one of these receiving bands.

Table 5.22.2-4: 2UL Band 28 + Band n3 harmonic and IMD for ISM and GNSS bands

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Victim Systems** | **Frequency range [MHz]** | | | **Impact** | **Regions** | **Comments** |
| COMPASS  (Beidou) | 1559 | - | 1591 | No |  |  |
| Galileo | 1559 | - | 1591 | No |  |  |
| GLONASS | 1591 | - | 1610 | No |  |  |
| GPS | 1563 | - | 1587 | No |  |  |
| ISM band  (2.4GHz) | 2400 | - | 2483.5 | Yes | US/Europe | IMD2 |
| 2400 | - | 2494 | Yes | Asia | IMD2 |
| ISM band  (5GHz) | 5150 | - | 5925 | Yes | US | 2nd harmonic, IMD4, IMD5 |
| 5150 | - | 5350 | Yes | Europe | 2nd harmonic |
| 5470 | - | 5725 | Yes | IMD5 |
| 5150 | - | 5825 | Yes | Asia | 2nd harmonic, IMD5 |

The requirements for spurious emission band UE coexistence already exist in 38.101-3 for DC\_28\_n3.

### 5.22.3 ∆TIB and ∆RIB values

Table 5.22.3-1: ΔTIB,c

| Inter-band EN-DC configuration | ΔTIB,c for E-UTRA band / NR band (dB)6 | | |
| --- | --- | --- | --- |
| Component band in order of bands in configuration7 | | |
| DC\_8-28\_n3 | 0.6 | 0.5 | 0.3 |

**Table 5.22.3-2: ΔRIB**

| **Inter-band EN-DC configuration** | ΔRIB,c for E-UTRA band / NR band (dB)7 | | |
| --- | --- | --- | --- |
| Component band in order of bands in configuration8 | | |
| DC\_8-28\_n3 | 0.2 | 0.1 | 0 |

### 5.22.4 Reference sensitivity exceptions

Table 5.22.4-1: 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\_8A-28A\_n3A | 8 | 912.5 | 5 | 25 | 957.5 | N/A | N/A |
| 28 | 745 | 5 | 25 | 800 | 30.4 | IMD24 |
| n3 | 1712.5 | 5 | 25 | 1807.5 | N/A | N/A |
| NOTE 4: This band is subject to IMD5 also which MSD is not specified. | | | | | | | |

## 5.23 DC\_20-32\_n7

### 5.23.1 Configurations for DC

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

| **EN-DC**  **configuration** | **Uplink EN-DC**  **configuration**  **(NOTE 1)** |
| --- | --- |
| DC\_20A-32A\_n7A | DC\_20A\_n7A |

### 5.23.2 Co-existence studies

Table 5.23.2-1 lists the Band 20A + Band n7A 2UL DC 2nd and 3rd order harmonics and 2nd, 3rd, 4th and 5th order IMD for the UE-to-UE coexistence analysis.

Table 5.23.2-1: Band 20 and Band n7 UL harmonics and IMD products

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **UE UL carriers** | **fx\_low** | **fx\_high** | | **fn\_low** | **fn\_high** | |
| UL frequency (MHz) | 832 | 862 | | 2500 | 2570 | |
| 2nd harmonics frequency limits | 2\*fx\_low | 2\*fx\_high | | 2\* fn\_low | 2\* fn\_high | |
| 2nd harmonics frequency limits (MHz) | 1664 – 1724 | | | 5000 – 5140 | | |
| 3rd harmonics frequency limits | 3\*fx\_low | | 3\*fx\_high | 3\* fn\_low | | 3\* fn\_high |
| 3rd harmonics frequency limits (MHz) | 2496 – 2586 | | | 7500 – 7710 | | |
| 2nd order IMD products | |fn\_low – fx\_high| | |fn\_high – fx\_low| | | |fn\_low + fx\_low| | |fn\_high + fx\_high| | |
| IMD frequency limits (MHz) | 1638 – 1738 | | | 3332 – 3432 | | |
| Two-tone 3rd order IMD products | |2\*fx\_low – fn\_high| | |2\*fx\_high – fn\_low| | | |2\*fn\_low – fx\_high| | |2\*fn\_high – fx\_low| | |
| IMD frequency limits (MHz) | 776 – 906 | | | 4138 – 4308 | | |
| Two-tone 3rd order IMD products | |2\*fx\_low + fn\_low| | |2\*fx\_high + fn\_high| | | |2\*fn\_low + fx\_low| | |2\*fn\_high + fx\_high| | |
| IMD frequency limits (MHz) | 4164 – 4294 | | | 5832 – 6002 | | |
| Two-tone 3rd order IMD products | (fx\_low – max BW fn) | | (fx\_high + max BW fn) | (fn\_low – max BW fx) | | (fn\_high + max BW fx) |
| IMD frequency limits (MHz) | 782 – 912 | | | 2480 – 2590 | | |
| Two-tone 4th order IMD products | |3\*fx\_low –1\* fn\_high| | | |3\*fx\_high – 1\*fn\_low| | |3\*fn\_low – 1\*fx\_high| | | |3\*fn\_high – 1\*fx\_low| |
| IMD frequency limits (MHz) | 74 – 86 | | | 6638 – 6878 | | |
| Two-tone 4th order IMD products | |2\*fx\_low –2\* fn\_high| | | |2\*fx\_high –2\* fn\_low| | |2\*fx\_low +2\* fn\_low| | | |2\*fx\_high +2\* fn\_high| |
| IMD frequency limits (MHz) | 3276 – 3476 | | | 6664 – 6864 | | |
| Two-tone 4th order IMD products | |3\*fx\_low +1\* fn\_low| | | |3\*fx\_high + 1\*fn\_high| | |3\*fn\_low + 1\*fx\_low| | | |3\*fn\_high + 1\*fx\_high| |
| IMD frequency limits (MHz) | 4996 – 5156 | | | 8332 – 8572 | | |
| Two-tone 5th order IMD products | |fx\_low – 4\*fn\_high| | | |fx\_high – 4\*fn\_low| | |fn\_low – 4\*fx\_high| | | |fn\_high – 4\*fx\_low| |
| IMD frequency limits (MHz) | 9138 – 9448 | | | 758 – 948 | | |
| Two-tone 5th order IMD products | |2\*fx\_low - 3\*fn\_high| | | |2\*fx\_high - 3\*fn\_low| | |2\*fn\_low - 3\*fx\_high| | | |2\*fn\_high -3\*fx\_low| |
| IMD frequency limits (MHz) | 5776 – 6046 | | | 2414 – 2644 | | |
| Two-tone 5th order IMD products | |fx\_low + 4\*fn\_low| | | |fx\_high + 4\*fn\_high| | |fn\_low + 4\*fx\_low| | | |fn\_high + 4\*fx\_high| |
| IMD frequency limits (MHz) | 10832 – 11142 | | | 5828 – 6018 | | |
| Two-tone 5th order IMD products | |2\*fx\_low + 3\*fn\_low| | | |2\*fx\_high + 3\*fn\_high| | |2\*fn\_low + 3\*fx\_low| | | |2\*fn\_high + 3\*fx\_high| |
| IMD frequency limits (MHz) | 9164 – 9434 | | | 7496 – 7726 | | |

Based on Table 5.23.2-1,

- 3rd order harmonics may fall into Rx frequencies of bands 38, 41, 69 and 90.

- 2nd order IMD may fall into Rx frequencies of bands 42, 52, 77 and 78.

- 3rd order IMD may fall into Rx frequencies of bands 5, 6, 18, 19, 20, 26, 27, 28, 44, 46, 47, 68 and 77.

- 4th order IMD may fall into Rx frequencies of bands 42, 46, 52, 77, 78 and 79.

- 5th order IMD may fall into Rx frequencies of bands 5, 6, 7, 8, 14, 18, 19, 20, 26, 27, 28, 38, 41, 44, 46, 47, 53, 68, 69 and 90.

When a 2UL inter-band DC UE is operating with other systems such as Wi-Fi, Bluetooth and GNSS, the harmonics and intermodulation products can have an impact on these systems. Table 5.23.2-2 lists if up to 3rd order harmonics and IMD up to 5th order falls into one of these receiving bands.

Table 5.23.2-2: 2UL Band 20 + Band n7 harmonic and IMD for ISM and GNSS bands

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Victim Systems** | **Frequency range [MHz]** | | | **Impact** | **Regions** | **Comments** |
| COMPASS  (Beidou) | 1559 | - | 1591 | No |  |  |
| Galileo | 1559 | - | 1591 | No |  |  |
| GLONASS | 1591 | - | 1610 | No |  |  |
| GPS | 1563 | - | 1587 | No |  |  |
| ISM band  (2.4GHz) | 2400 | - | 2483.5 | Yes | US/Europe | IMD5 |
| 2400 | - | 2494 | Yes | Asia | IMD5 |
| ISM band  (5GHz) | 5150 | - | 5925 | Yes | US | IMD3, IMD4, IMD5 |
| 5150 | - | 5350 | Yes | Europe | IMD4, IMD5 |
| 5470 | - | 5725 | No |  |
| 5150 | - | 5825 | Yes | Asia | IMD4, IMD5 |

The requirements for spurious emission band UE coexistence already exist in 38.101-3 for DC\_20\_n7.

### 5.23.3 ∆TIB and ∆RIB values

Table 5.23.3-1: ΔTIB,c

| Inter-band EN-DC configuration | ΔTIB,c for E-UTRA band / NR band (dB)6 | | |
| --- | --- | --- | --- |
| Component band in order of bands in configuration7 | | |
| DC\_20-32\_n7 | 0.3 | 0 | 0.7 |

### 5.23.4 Reference sensitivity exceptions

No addition exceptions required compared to fallbacks.

## 5.24 DC\_7-8\_n7

### 5.24.1 Configurations for DC

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

| DC  Configuration | Uplink configuration |
| --- | --- |
| DC\_7A-8A\_n7A | DC\_7A\_n7A  DC\_8A\_n7A |

### 5.24.2 Co-existence studies

For UL configuration of DC\_7A\_n7A, only single UL is required. Thus no IMD issue needs to be evaluated. Besides, there is no harmonic issue from DC\_7A\_n7A to Band 8 DL reception.

For UE coexistence study of Band 8 + Band n7, the 2nd, 3rd and 4th order harmonics and 2nd, 3rd, 4th and 5th order intermodulation products were calculated and presented in Table 5.24.2-1.

**Table 5.24.2-1: Harmonic and IMD analysis**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **UE UL carriers** | **fx\_low** | **fx\_high** | **fy\_low** | **fy\_high** |
| UL frequency (MHz) | 880 | 915 | 2500 | 2570 |
| 2nd harmonics frequency limits | 2\*fx\_low | 2\*fx\_high | 2\* fy\_low | 2\* fy\_high |
| 2nd harmonics frequency limits (MHz) | 1760 | 1830 | 5000 | 5140 |
| 3rd harmonics frequency limits | 3\*fx\_low | 3\*fx\_high | 3\* fy\_low | 3\* fy\_high |
| 3rd harmonics frequency limits (MHz) | 2640 | 2745 | 7500 | 7710 |
| 4th harmonics frequency limits | 4\*fx\_low | 4\*fx\_high | 4\* fy\_low | 4\* fy\_high |
| 4th harmonics frequency limits (MHz) | 3520 | 3660 | 10000 | 10280 |
| 2nd order IMD products | |fy\_low – fx\_high| | |fy\_high – fx\_low| | |fy\_low + fx\_low| | |fy\_high + fx\_high| |
| IMD frequency limits (MHz) | 1585 | 1690 | 3380 | 3485 |
| Two-tone 3rd order IMD products | |2\*fx\_high – fy\_low| | |2\*fx\_low – fy\_high| | |2\*fy\_low – fx\_high| | |2\*fy\_high – fx\_low| |
| IMD frequency limits (MHz) | 670 | 810 | 4085 | 4260 |
| Two-tone 3rd order IMD products | |2\*fx\_low + fy\_low| | |2\*fx\_high + fy\_high| | |2\*fy\_low + fx\_low| | |2\*fy\_high + fx\_high| |
| IMD frequency limits (MHz) | 4260 | 4400 | 5880 | 6055 |
| Two-tone 4th order IMD products | |3\*fx\_low - fy\_high| | |3\*fx\_high - fy\_low| | |3\*fy\_low - fx\_high| | |3\*fy\_high - fx\_low| |
| IMD frequency limits (MHz) | 70 | 245 | 6585 | 6830 |
| Two-tone 4th order IMD products | |3\*fx\_low + fy\_low| | |3\*fx\_high + fy\_high| | |3\*fy\_low + fx\_low| | |3\*fy\_high + fx\_high| |
| IMD frequency limits (MHz) | 5140 | 5315 | 8380 | 8625 |
| Two-tone 4th order IMD products | |2\*fx\_high –2\* fy\_low| | |2\*fx\_low - 2\* fy\_high| | |2\*fx\_low +2\* fy\_low| | |2\*fx\_high +2\* fy\_high| |
| IMD frequency limits (MHz) | 3170 | 3310 | 6760 | 6970 |
| Two-tone 5th order IMD products | |fx\_high – 4\*fy\_low| | |fx\_low – 4\*fy\_high| | |fy\_high – 4\*fx\_low| | |fy\_low – 4\*fx\_high| |
| IMD frequency limits (MHz) | 9085 | 9400 | 950 | 1160 |
| Two-tone 5th order IMD products | |2\*fx\_high - 3\*fy\_low| | |2\*fx\_low - 3\*fy\_high| | |2\*fy\_low - 3\*fx\_high| | |2\*fy\_high -3\*fx\_low| |
| IMD frequency limits (MHz) | 5670 | 5950 | 2255 | 2500 |
| Two-tone 5th order IMD products | |fx\_low + 4\*fy\_low| | |fx\_high + 4\*fy\_high| | |fy\_low + 4\*fx\_low| | |fy\_high + 4\*fx\_high| |
| IMD frequency limits (MHz) | 10880 | 11195 | 6020 | 6230 |
| Two-tone 5th order IMD products | |2\*fx\_low + 3\*fy\_low| | |2\*fx\_high + 3\*fy\_high| | |2\*fy\_low + 3\*fx\_low| | |2\*fy\_high + 3\*fx\_high| |
| IMD frequency limits (MHz) | 9260 | 9540 | 7640 | 7885 |

As we can see from the above table, there could be MSD due to IMD:

- The 5th order IMD generated by Band 8 and Band n7 may fall into DL reception frequency of Band 8.

But when we consider the implementation of Band 8 duplexer, we can find that such 5th order IMD will not impact the DL reception of Band 8.

The 3rd order harmonic generated by Band 8 will fall into DL reception frequency of Band n7.

### 5.24.3 ∆TIB and ∆RIB values

For DC\_7-8\_n7, the ΔTIB,c and ΔRIB,c values are given in the following tables.

Table 5.24.3-1: ΔTIB,c

| Inter-band EN-DC configuration | ΔTIB,c for E-UTRA band / NR band (dB)6 | | |
| --- | --- | --- | --- |
| Component band in order of bands in configuration7 | | |
| DC\_7-8\_n7 | 0.3 | 0.6 | 0.3 |

**Table 5.24.3-2: ΔRIB**

| **Inter-band EN-DC configuration** | ΔRIB,c for E-UTRA band / NR band (dB)7 | | |
| --- | --- | --- | --- |
| Component band in order of bands in configuration8 | | |
| DC\_7-8\_n7 | 0 | 0.2 | 0 |

### 5.24.4 Reference sensitivity exceptions

Compared to its fallback modes, no additional MSD requirements for this band combination are needed.

## 5.25 DC\_3-5\_n40

5.25.1 Configurations for DC

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

| DC  Configuration | Uplink DC  configuration |
| --- | --- |
| DC\_3A-5A\_n40A | DC\_3A\_n40A DC\_5A\_n40A |

### 5.25.2 Co-existence studies

For UE coexistence study of Band 3 + Band n40, the 2nd, 3rd, 4th, and 5th order harmonics and 2nd, 3rd, 4th and 5th order intermodulation products were calculated and presented in Table 5.25.2-1

**Table 5.25.2-1: Harmonic and IMD analysis**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Fx low | Fx high | Fy low | Fy high |
| UL Frequency [MHz] | 1710 | 1785 | 2300 | 2400 |
| 2nd harmonics frequency limits | 2\*fx\_low | 2\*fx\_high | 2\* fy\_low | 2\* fy\_high |
| 2nd harmonics frequency limits (MHz) | 3420 | 3570 | 4600 | 4800 |
| 3rd harmonics frequency limits | 3\*fx\_low | 3\*fx\_high | 3\* fy\_low | 3\* fy\_high |
| 3rd harmonics frequency limits (MHz) | 5130 | 5355 | 6900 | 7200 |
| 4th harmonics frequency limits | 4\*fx\_low | 4\*fx\_high | 4\* fy\_low | 4\* fy\_high |
| 4th harmonics frequency limits (MHz) | 6840 | 7140 | 9200 | 9600 |
| 5th harmonics frequency limits | 5\*fx\_low | 5\*fx\_high | 5\* fy\_low | 5\* fy\_high |
| 5th harmonics frequency limits (MHz) | 8550 | 8925 | 11500 | 12000 |
| Two tone 2nd order IMD products | |fy\_low – fx\_high| | |fy\_high – fx\_low| | |fy\_low + fx\_low| | |fy\_high + fx\_high| |
| IMD frequency limits (MHz) | 515 | 690 | 4010 | 4185 |
| Two tone 3rd order IMD products | |2\*fx\_low – fy\_high| | |2\*fx\_high – fy\_low| | |2\*fy\_low – fx\_high| | |2\*fy\_high – fx\_low| |
| IMD frequency limits (MHz) | 102 | 1270 | 2815 | 3090 |
| Two tone 3rd order IMD products | |2\*fx\_low + fy\_low| | |2\*fx\_high + fy\_high| | |2\*fy\_low + fx\_low| | |2\*fy\_high + fx\_high| |
| IMD frequency limits (MHz) | 5720 | 5970 | 6310 | 6585 |
| Two-tone 4th order IMD products | |3\*fx\_low –1\* fy\_high| | |3\*fx\_high – 1\*fy\_low| | |3\*fy\_low – 1\*fx\_high| | |3\*fy\_high – 1\*fx\_low| |
| IMD frequency limits (MHz) | 2730 | 3055 | 5115 | 5490 |
| Two-tone 4th order IMD products | |2\*fx\_low –2\* fy\_high| | |2\*fx\_high –2\* fy\_low| | |2\*fx\_low +2\* fy\_low| | |2\*fx\_high +2\* fy\_high| |
| IMD frequency limits (MHz) | 1380 | 1030 | 8020 | 8370 |
| Two-tone 4th order IMD products | |3\*fx\_low +1\* fy\_low| | |3\*fx\_high + 1\*fy\_high| | |3\*fy\_low + 1\*fx\_low| | |3\*fy\_high + 1\*fx\_high| |
| IMD frequency limits (MHz) | 7430 | 7755 | 8610 | 8985 |
| Two-tone 5th order IMD products | |fx\_low – 4\*fy\_high| | |fx\_high – 4\*fy\_low| | |fy\_low – 4\*fx\_high| | |fy\_high – 4\*fx\_low| |
| IMD frequency limits (MHz) | 7890 | 7415 | 4840 | 4440 |
| Two-tone 5th order IMD products | |2\*fx\_low - 3\*fy\_high| | |2\*fx\_high - 3\*fy\_low| | |2\*fy\_low - 3\*fx\_high| | |2\*fy\_high -3\*fx\_low| |
| IMD frequency limits (MHz) | 3780 | 3330 | 755 | 330 |
| Two-tone 5th order IMD products | |fx\_low + 4\*fy\_low| | |fx\_high + 4\*fy\_high| | |fy\_low + 4\*fx\_low| | |fy\_high + 4\*fx\_high| |
| IMD frequency limits (MHz) | 10910 | 11385 | 9140 | 9540 |
| Two-tone 5th order IMD products | |2\*fx\_low + 3\*fy\_low| | |2\*fx\_high + 3\*fy\_high| | |2\*fy\_low + 3\*fx\_low| | |2\*fy\_high + 3\*fx\_high| |
| IMD frequency limits (MHz) | 10320 | 10770 | 9730 | 10155 |

For UE coexistence study of Band 5 + Band n40, the 2nd, 3rd, 4th, and 5th order harmonics and 2nd, 3rd, 4th and 5th order intermodulation products were calculated and presented in Table 5.25.2-2

**Table 5.25.2-2: Harmonic and IMD analysis**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Fx low | Fx high | Fy low | Fy high |
| UL Frequency [MHz] | 824 | 849 | 2300 | 2400 |
| 2nd harmonics frequency limits | 2\*fx\_low | 2\*fx\_high | 2\* fy\_low | 2\* fy\_high |
| 2nd harmonics frequency limits (MHz) | 1648 | 1698 | 4600 | 4800 |
| 3rd harmonics frequency limits | 3\*fx\_low | 3\*fx\_high | 3\* fy\_low | 3\* fy\_high |
| 3rd harmonics frequency limits (MHz) | 2472 | 2547 | 6900 | 7200 |
| 4th harmonics frequency limits | 4\*fx\_low | 4\*fx\_high | 4\* fy\_low | 4\* fy\_high |
| 4th harmonics frequency limits (MHz) | 3296 | 3396 | 9200 | 9600 |
| 5th harmonics frequency limits | 5\*fx\_low | 5\*fx\_high | 5\* fy\_low | 5\* fy\_high |
| 5th harmonics frequency limits (MHz) | 4120 | 4245 | 11500 | 12000 |
| Two tone 2nd order IMD products | |fy\_low – fx\_high| | |fy\_high – fx\_low| | |fy\_low + fx\_low| | |fy\_high + fx\_high| |
| IMD frequency limits (MHz) | 1451 | 1576 | 3124 | 3249 |
| Two tone 3rd order IMD products | |2\*fx\_low – fy\_high| | |2\*fx\_high – fy\_low| | |2\*fy\_low – fx\_high| | |2\*fy\_high – fx\_low| |
| IMD frequency limits (MHz) | 752 | 602 | 3751 | 3976 |
| Two tone 3rd order IMD products | |2\*fx\_low + fy\_low| | |2\*fx\_high + fy\_high| | |2\*fy\_low + fx\_low| | |2\*fy\_high + fx\_high| |
| IMD frequency limits (MHz) | 3948 | 4098 | 5424 | 5649 |
| Two-tone 4th order IMD products | |3\*fx\_low –1\* fy\_high| | |3\*fx\_high – 1\*fy\_low| | |3\*fy\_low – 1\*fx\_high| | |3\*fy\_high – 1\*fx\_low| |
| IMD frequency limits (MHz) | 72 | 247 | 6051 | 6376 |
| Two-tone 4th order IMD products | |2\*fx\_low –2\* fy\_high| | |2\*fx\_high –2\* fy\_low| | |2\*fx\_low +2\* fy\_low| | |2\*fx\_high +2\* fy\_high| |
| IMD frequency limits (MHz) | 3152 | 2902 | 6248 | 6498 |
| Two-tone 4th order IMD products | |3\*fx\_low +1\* fy\_low| | |3\*fx\_high + 1\*fy\_high| | |3\*fy\_low + 1\*fx\_low| | |3\*fy\_high + 1\*fx\_high| |
| IMD frequency limits (MHz) | 4772 | 4947 | 7724 | 8049 |
| Two-tone 5th order IMD products | |fx\_low – 4\*fy\_high| | |fx\_high – 4\*fy\_low| | |fy\_low – 4\*fx\_high| | |fy\_high – 4\*fx\_low| |
| IMD frequency limits (MHz) | 8776 | 8351 | 1096 | 896 |
| Two-tone 5th order IMD products | |2\*fx\_low - 3\*fy\_high| | |2\*fx\_high - 3\*fy\_low| | |2\*fy\_low - 3\*fx\_high| | |2\*fy\_high -3\*fx\_low| |
| IMD frequency limits (MHz) | 5552 | 5202 | 2053 | 2328 |
| Two-tone 5th order IMD products | |fx\_low + 4\*fy\_low| | |fx\_high + 4\*fy\_high| | |fy\_low + 4\*fx\_low| | |fy\_high + 4\*fx\_high| |
| IMD frequency limits (MHz) | 10024 | 10449 | 5596 | 5796 |
| Two-tone 5th order IMD products | |2\*fx\_low + 3\*fy\_low| | |2\*fx\_high + 3\*fy\_high| | |2\*fy\_low + 3\*fx\_low| | |2\*fy\_high + 3\*fx\_high| |
| IMD frequency limits (MHz) | 8548 | 8898 | 7072 | 7347 |

The Rx impacts can be identified as below.

* No IMD products generated by DC\_3\_n40 uplink fall into own Rx of band 5.
* No IMD products generated by DC\_5\_n40 uplink fall into own Rx of band 3.

5.25.3 ∆TIB and ∆RIB values

For DC\_3-5\_n40, the ΔTIB,c and ΔRIB,c values are reused from DC\_3-8\_n40 which is similar

Table 5.25.3-1: ΔTIB,c

| Inter-band EN-DC configuration | ΔTIB,c for E-UTRA band / NR band (dB)6 | | |
| --- | --- | --- | --- |
| Component band in order of bands in configuration7 | | |
| DC\_3-5\_n40 | 0.5 | 0.3 | 0.5 |

Table 5.25.3-2: ΔRIB

| **Inter-band EN-DC configuration** | ΔRIB,c for E-UTRA band / NR band (dB)7 | | |
| --- | --- | --- | --- |
| Component band in order of bands in configuration8 | | |
| DC\_3-5\_n40 | 0 | 0 | 0 |

5.25.4 Reference sensitivity exceptions

No additional MSD requirements need to be defined.

5.26 DC\_1-28\_n38

### 5.26.1 Configuration for DC

Table 5.26.2-1: Inter-band EN-DC configurations (three bands)

| EN-DC  Configuration | Uplink EN-DC  configuration  (NOTE 1) | E-UTRA CA configuration | NR band |
| --- | --- | --- | --- |
| DC\_1A-28A\_n38A | DC\_1A\_n38A  DC\_28A\_n38A | CA\_1A-28A | n38A |

### 5.26.2 Co-existence studies

There are IMD5 impact from UL 1\_n38 affecting DL band 28.

There are no IMD impact from UL 28\_n38 affecting DL band 1.

5.26.3 ∆TIB and ∆RIB values

For DC\_1-28\_n38, the ΔTIB,c and ΔRIB,c values are reused from DC\_1-28\_n7 and are given in the tables below.

**Table 5.1.3-1:ΔTIB,c due to EN-DC (three bands)**

| Inter-band EN-DC configuration | ΔTIB,c for E-UTRA band / NR band (dB)6 | | |
| --- | --- | --- | --- |
| Component band in order of bands in configuration7 | | |
| DC\_1-28\_n38 | 0.5 | 0.6 | 0.6 |
| NOTE 6: “-” denotes ΔTIB,c = 0.  NOTE 7: The component band order in the configuration should be listed by the order of E-UTRA band and NR band respectively, such as for DC\_66\_(n)12 the band order from left to right is 12, 66 and n12. | | | |

**Table 5.1.3-2:ΔRIB,c due to EN-DC (three bands)**

| **Inter-band EN-DC configuration** | ΔRIB,c for E-UTRA band / NR band (dB)7 | | |
| --- | --- | --- | --- |
| Component band in order of bands in configuration8 | | |
| DC\_1-28\_n38 | - | 0.2 | - |
| NOTE 7: “-” denotes ΔRIB,c = 0.  NOTE 8: The component band order in the configuration should be listed by the order of E-UTRA band and NR band respectively, such as for DC\_5\_(n)12 the band order from left to right is 5, 12 and n12. | | | |

5.26.4 REFSENS requirements

MSD values are reused from DC\_1A-28A\_n7A.

Table 7.3B.2.3.5.2-1: 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-28A\_n38A | 1 | 1975 | 5 | 25 | 2165 | N/A | N/A |
|  | 28 | 710 | 5 | 25 | 765 | 4.5 | IMD5 |
|  | n38 | 2580 | 5 | 25 | 2580 | N/A | N/A |

5.27 DC\_3-28\_n38

### 5.27.1 Configuration for DC

Table 5.27.2-1: Inter-band EN-DC configurations (three bands)

| EN-DC  Configuration | Uplink EN-DC  configuration  (NOTE 1) | E-UTRA CA configuration | NR band |
| --- | --- | --- | --- |
| DC\_3A-28A\_n38A | DC\_3A\_n38A  DC\_28A\_n38A | CA\_3A-28A | n38A |

### 5.27.2 Co-existence studies

There are IMD2 and IMD3 impact from UL 3\_n38 affecting DL band 28.

There are IMD2 impact from UL 28\_n38 affecting DL band 3.

5.27.3 ∆TIB and ∆RIB values

For DC\_3-28\_n38, the ΔTIB,c and ΔRIB,c values are reused from DC\_3-28\_n7 and are given in the tables below.

**Table 5.1.3-1:ΔTIB,c due to EN-DC (three bands)**

| Inter-band EN-DC configuration | ΔTIB,c for E-UTRA band / NR band (dB)6 | | |
| --- | --- | --- | --- |
| Component band in order of bands in configuration7 | | |
| DC\_3-28\_n38 | 0.5 | 0.3 | 0.5 |
| NOTE 6: “-” denotes ΔTIB,c = 0.  NOTE 7: The component band order in the configuration should be listed by the order of E-UTRA band and NR band respectively, such as for DC\_66\_(n)12 the band order from left to right is 12, 66 and n12. | | | |

**Table 5.1.3-2:ΔRIB,c due to EN-DC (three bands)**

| **Inter-band EN-DC configuration** | ΔRIB,c for E-UTRA band / NR band (dB)7 | | |
| --- | --- | --- | --- |
| Component band in order of bands in configuration8 | | |
| DC\_3-28\_n38 | - | - | - |
| NOTE 7: “-” denotes ΔRIB,c = 0.  NOTE 8: The component band order in the configuration should be listed by the order of E-UTRA band and NR band respectively, such as for DC\_5\_(n)12 the band order from left to right is 5, 12 and n12. | | | |

5.27.4 REFSENS requirements

MSD values are reused from DC\_3A-28A\_n7A.

Table 7.3B.2.3.5.2-1: 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-28A\_n38A | 3 | 1775 | 5 | 25 | 1870 | 26.0 | IMD2 |
|  | 28 | 710 | 5 | 25 | 765 | N/A | N/A |
|  | n38 | 2580 | 5 | 25 | 2580 | N/A | N/A |
|  | 3 | 1780 | 5 | 25 | 1875 | N/A | N/A |
|  | 28 | 745 | 5 | 25 | 800 | 20.0 | IMD21 |
|  | n38 | 2580 | 5 | 25 | 2580 | N/A | N/A |
| NOTE 1: This band is subject to IMD3 also which MSD is not specified. | | | | | | | |

## 5.28 DC\_20-28\_n78

### 5.28.1 Configurations for DC

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

| **EN-DC**  **configuration** | **Uplink EN-DC**  **configuration**  **(NOTE 1)** |
| --- | --- |
| DC\_20A-28A\_n78A | DC\_20A\_n78A  DC\_28A\_n78A |

### 5.28.2 Co-existence studies

Table 5.28.2-1 lists the Band 20A + Band n78A 2UL DC 2nd and 3rd order harmonics and 2nd, 3rd, 4th and 5th order IMD for the UE-to-UE coexistence analysis.

Table 5.28.2-1: Band 20 and Band n78 UL harmonics and IMD products

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **UE UL carriers** | **fx\_low** | **fx\_high** | | **fn\_low** | **fn\_high** | |
| UL frequency (MHz) | 832 | 862 | | 3300 | 3800 | |
| 2nd harmonics frequency limits | 2\*fx\_low | 2\*fx\_high | | 2\* fn\_low | 2\* fn\_high | |
| 2nd harmonics frequency limits (MHz) | 1664 – 1724 | | | 6600 – 7600 | | |
| 3rd harmonics frequency limits | 3\*fx\_low | | 3\*fx\_high | 3\* fn\_low | | 3\* fn\_high |
| 3rd harmonics frequency limits (MHz) | 2496 – 2586 | | | 9900 – 11400 | | |
| 2nd order IMD products | |fn\_low – fx\_high| | |fn\_high – fx\_low| | | |fn\_low + fx\_low| | |fn\_high + fx\_high| | |
| IMD frequency limits (MHz) | 2438 – 2968 | | | 4132 – 4662 | | |
| Two-tone 3rd order IMD products | |2\*fx\_low – fn\_high| | |2\*fx\_high – fn\_low| | | |2\*fn\_low – fx\_high| | |2\*fn\_high – fx\_low| | |
| IMD frequency limits (MHz) | 1576 – 2136 | | | 5738 – 6768 | | |
| Two-tone 3rd order IMD products | |2\*fx\_low + fn\_low| | |2\*fx\_high + fn\_high| | | |2\*fn\_low + fx\_low| | |2\*fn\_high + fx\_high| | |
| IMD frequency limits (MHz) | 4964 – 5524 | | | 7432 – 8462 | | |
| Two-tone 3rd order IMD products | (fx\_low – max BW fn) | | (fx\_high + max BW fn) | (fn\_low – max BW fx) | | (fn\_high + max BW fx) |
| IMD frequency limits (MHz) | 732 – 962 | | | 3280 – 3820 | | |
| Two-tone 4th order IMD products | |3\*fx\_low –1\* fn\_high| | | |3\*fx\_high – 1\*fn\_low| | |3\*fn\_low – 1\*fx\_high| | | |3\*fn\_high – 1\*fx\_low| |
| IMD frequency limits (MHz) | 714 – 1304 | | | 9038 – 10568 | | |
| Two-tone 4th order IMD products | |2\*fx\_low –2\* fn\_high| | | |2\*fx\_high –2\* fn\_low| | |2\*fx\_low +2\* fn\_low| | | |2\*fx\_high +2\* fn\_high| |
| IMD frequency limits (MHz) | 4876 – 5936 | | | 8264 – 9324 | | |
| Two-tone 4th order IMD products | |3\*fx\_low +1\* fn\_low| | | |3\*fx\_high + 1\*fn\_high| | |3\*fn\_low + 1\*fx\_low| | | |3\*fn\_high + 1\*fx\_high| |
| IMD frequency limits (MHz) | 5796 – 6386 | | | 10732 – 12262 | | |
| Two-tone 5th order IMD products | |fx\_low – 4\*fn\_high| | | |fx\_high – 4\*fn\_low| | |fn\_low – 4\*fx\_high| | | |fn\_high – 4\*fx\_low| |
| IMD frequency limits (MHz) | 12338 – 14368 | | | 148 – 472 | | |
| Two-tone 5th order IMD products | |2\*fx\_low - 3\*fn\_high| | | |2\*fx\_high - 3\*fn\_low| | |2\*fn\_low - 3\*fx\_high| | | |2\*fn\_high -3\*fx\_low| |
| IMD frequency limits (MHz) | 8176 – 9736 | | | 4014 – 5104 | | |
| Two-tone 5th order IMD products | |fx\_low + 4\*fn\_low| | | |fx\_high + 4\*fn\_high| | |fn\_low + 4\*fx\_low| | | |fn\_high + 4\*fx\_high| |
| IMD frequency limits (MHz) | 14032 – 16062 | | | 6628 – 7248 | | |
| Two-tone 5th order IMD products | |2\*fx\_low + 3\*fn\_low| | | |2\*fx\_high + 3\*fn\_high| | |2\*fn\_low + 3\*fx\_low| | | |2\*fn\_high + 3\*fx\_high| |
| IMD frequency limits (MHz) | 11564 – 13124 | | | 9096 – 10186 | | |

Based on Table 5.28.2-1,

- 2nd order harmonics may fall into Rx frequencies of bands 38, 41, 69 and 90.

- 2nd order IMD may fall into Rx frequencies of bands 7, 38, 41, 53, 69, 77, 79 and 90.

- 3rd order IMD may fall into Rx frequencies of bands 1, 2, 3, 4, 9, 10, 25, 33, 34, 35, 36, 37, 39, 46, 47, 65, 66, 70 and 79.

- 4th order IMD may fall into Rx frequencies of bands 5, 6, 8, 12, 13, 14, 17, 18, 19, 20, 26, 27, 28, 29, 44, 46, 47, 67, 68, 79 and 85.

- 5th order IMD may fall into Rx frequencies of bands 31, 72, 73, 77, 79, 87 and 88.

When a 2UL inter-band DC UE is operating with other systems such as Wi-Fi, Bluetooth and GNSS, the harmonics and intermodulation products can have an impact on these systems. Table 5.28.2-2 lists if up to 3rd order harmonics and IMD up to 5th order falls into one of these receiving bands.

Table 5.28.2-2: 2UL Band 20 + Band n78 harmonic and IMD for ISM and GNSS bands

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Victim Systems** | **Frequency range [MHz]** | | | **Impact** | **Regions** | **Comments** |
| COMPASS  (Beidou) | 1559 | - | 1591 | Yes |  | IMD3 |
| Galileo | 1559 | - | 1591 | Yes |  | IMD3 |
| GLONASS | 1591 | - | 1610 | Yes |  | IMD3 |
| GPS | 1563 | - | 1587 | Yes |  | IMD3 |
| ISM band  (2.4GHz) | 2400 | - | 2483.5 | Yes | US/Europe | IMD2 |
| 2400 | - | 2494 | Yes | Asia | IMD2 |
| ISM band  (5GHz) | 5150 | - | 5925 | Yes | US | IMD3, IMD4 |
| 5150 | - | 5350 | Yes | Europe | IMD3, IMD4 |
| 5470 | - | 5725 | Yes | IMD3, IMD4 |
| 5150 | - | 5825 | Yes | Asia | IMD3, IMD4 |

The requirements for spurious emission band UE coexistence already exist in 38.101-3 for DC\_20\_n78.

Table 5.28.2-3 lists the Band 28A + Band n78A 2UL DC 2nd and 3rd order harmonics and 2nd, 3rd, 4th and 5th order IMD for the UE-to-UE coexistence analysis.

Table 5.28.2-3: Band 28 and Band n78 UL harmonics and IMD products

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **UE UL carriers** | **fx\_low** | **fx\_high** | | **fn\_low** | **fn\_high** | |
| UL frequency (MHz) | 703 | 748 | | 3300 | 3800 | |
| 2nd harmonics frequency limits | 2\*fx\_low | 2\*fx\_high | | 2\* fn\_low | 2\* fn\_high | |
| 2nd harmonics frequency limits (MHz) | 1406 – 1496 | | | 6600 – 7600 | | |
| 3rd harmonics frequency limits | 3\*fx\_low | | 3\*fx\_high | 3\* fn\_low | | 3\* fn\_high |
| 3rd harmonics frequency limits (MHz) | 2109 – 2244 | | | 9900 – 11400 | | |
| 2nd order IMD products | |fn\_low – fx\_high| | |fn\_high – fx\_low| | | |fn\_low + fx\_low| | |fn\_high + fx\_high| | |
| IMD frequency limits (MHz) | 2552 – 3097 | | | 4003 – 4548 | | |
| Two-tone 3rd order IMD products | |2\*fx\_low – fn\_high| | |2\*fx\_high – fn\_low| | | |2\*fn\_low – fx\_high| | |2\*fn\_high – fx\_low| | |
| IMD frequency limits (MHz) | 1804 – 2394 | | | 5852 – 6897 | | |
| Two-tone 3rd order IMD products | |2\*fx\_low + fn\_low| | |2\*fx\_high + fn\_high| | | |2\*fn\_low + fx\_low| | |2\*fn\_high + fx\_high| | |
| IMD frequency limits (MHz) | 4706 – 5296 | | | 7303 – 8348 | | |
| Two-tone 3rd order IMD products | (fx\_low – max BW fn) | | (fx\_high + max BW fn) | (fn\_low – max BW fx) | | (fn\_high + max BW fx) |
| IMD frequency limits (MHz) | 603 – 848 | | | 3280 – 3820 | | |
| Two-tone 4th order IMD products | |3\*fx\_low –1\* fn\_high| | | |3\*fx\_high – 1\*fn\_low| | |3\*fn\_low – 1\*fx\_high| | | |3\*fn\_high – 1\*fx\_low| |
| IMD frequency limits (MHz) | 1056 – 1691 | | | 9152 – 10697 | | |
| Two-tone 4th order IMD products | |2\*fx\_low –2\* fn\_high| | | |2\*fx\_high –2\* fn\_low| | |2\*fx\_low +2\* fn\_low| | | |2\*fx\_high +2\* fn\_high| |
| IMD frequency limits (MHz) | 5104 – 6194 | | | 8006 – 9096 | | |
| Two-tone 4th order IMD products | |3\*fx\_low +1\* fn\_low| | | |3\*fx\_high + 1\*fn\_high| | |3\*fn\_low + 1\*fx\_low| | | |3\*fn\_high + 1\*fx\_high| |
| IMD frequency limits (MHz) | 5409 – 6044 | | | 10603 – 12148 | | |
| Two-tone 5th order IMD products | |fx\_low – 4\*fn\_high| | | |fx\_high – 4\*fn\_low| | |fn\_low – 4\*fx\_high| | | |fn\_high – 4\*fx\_low| |
| IMD frequency limits (MHz) | 12452 – 14497 | | | 308 – 988 | | |
| Two-tone 5th order IMD products | |2\*fx\_low - 3\*fn\_high| | | |2\*fx\_high - 3\*fn\_low| | |2\*fn\_low - 3\*fx\_high| | | |2\*fn\_high -3\*fx\_low| |
| IMD frequency limits (MHz) | 8404 – 9994 | | | 4356 – 5491 | | |
| Two-tone 5th order IMD products | |fx\_low + 4\*fn\_low| | | |fx\_high + 4\*fn\_high| | |fn\_low + 4\*fx\_low| | | |fn\_high + 4\*fx\_high| |
| IMD frequency limits (MHz) | 13903 – 15948 | | | 6112 – 6792 | | |
| Two-tone 5th order IMD products | |2\*fx\_low + 3\*fn\_low| | | |2\*fx\_high + 3\*fn\_high| | |2\*fn\_low + 3\*fx\_low| | | |2\*fn\_high + 3\*fx\_high| |
| IMD frequency limits (MHz) | 11306 – 12896 | | | 8709 – 9844 | | |

Based on Table 5.28.2-3,

- 2nd order harmonics may fall into Rx frequencies of bands 1, 4, 10, 23, 65 and 66.

- 3rd order harmonics may fall into Rx frequencies of bands 11, 21, 32, 45, 50, 51, 74, 75, 76, 91, 92, 93 and 94.

- 2nd order IMD may fall into Rx frequencies of bands 7, 38, 41, 69, 77, 79 and 90.

- 3rd order IMD may fall into Rx frequencies of bands 1, 2, 3, 4, 9, 10, 23, 25, 30, 33, 34, 35, 36, 37, 39, 40, 46, 47, 65, 66, 70 and 79.

- 4th order IMD may fall into Rx frequencies of bands 11, 21, 24, 32, 45, 46, 46, 47, 47, 50, 51, 74, 75, 76, 91, 92, 93 and 94.

- 5th order IMD may fall into Rx frequencies of bands 5, 6, 8, 12, 13, 14, 17, 18, 19, 20, 26, 27, 28, 29, 31, 44, 46, 67, 68, 71, 72, 73, 79, 85, 87 and 88.

When a 2UL inter-band DC UE is operating with other systems such as Wi-Fi, Bluetooth and GNSS, the harmonics and intermodulation products can have an impact on these systems. Table 5.28.2-4 lists if up to 3rd order harmonics and IMD up to 5th order falls into one of these receiving bands.

Table 5.28.2-4: 2UL Band 28 + Band n78 harmonic and IMD for ISM and GNSS bands

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Victim Systems** | **Frequency range [MHz]** | | | **Impact** | **Regions** | **Comments** |
| COMPASS  (Beidou) | 1559 | - | 1591 | Yes |  | IMD4 |
| Galileo | 1559 | - | 1591 | Yes |  | IMD4 |
| GLONASS | 1591 | - | 1610 | Yes |  | IMD4 |
| GPS | 1563 | - | 1587 | Yes |  | IMD4 |
| ISM band  (2.4GHz) | 2400 | - | 2483.5 | No | US/Europe |  |
| 2400 | - | 2494 | No | Asia |  |
| ISM band  (5GHz) | 5150 | - | 5925 | Yes | US | IMD3, IMD4, IMD5 |
| 5150 | - | 5350 | Yes | Europe | IMD3, IMD4, IMD5 |
| 5470 | - | 5725 | Yes | IMD4, IMD5 |
| 5150 | - | 5825 | Yes | Asia | IMD3, IMD4, IMD5 |

The requirements for spurious emission band UE coexistence already exist in 38.101-3 for DC\_28\_n78.

### 5.28.3 ∆TIB and ∆RIB values

Table 5.28.3-1: ΔTIB,c

| Inter-band EN-DC configuration | ΔTIB,c for E-UTRA band / NR band (dB)6 | | |
| --- | --- | --- | --- |
| Component band in order of bands in configuration7 | | |
| DC\_20-28\_n78 | 0.6 | 0.5 | 0.8 |

**Table 5.28.3-2: ΔRIB**

| **Inter-band EN-DC configuration** | ΔRIB,c for E-UTRA band / NR band (dB)7 | | |
| --- | --- | --- | --- |
| Component band in order of bands in configuration8 | | |
| DC\_20-28\_n78 | 0 | 0.2 | 0.5 |

### 5.28.4 Reference sensitivity exceptions

Table 5.284-1: 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\_20A-28A\_n78A | 20 | 837 | 5 | 25 | 796 | N/A | N/A |
| 28 | 744 | 5 | 25 | 799 | 9.4 | IMD4 |
| n78 | 3310 | 10 | 50 | 3310 | N/A | N/A |
| 20 | 849 | 5 | 25 | 808 | 3.8 | IMD5 |
| 28 | 705.5 | 5 | 25 | 760.5 | N/A | N/A |
| n78 | 3630 | 10 | 50 | 3630 | N/A | N/A |

## 5.29 DC\_1-28\_n20

### 5.29.1 Configurations for DC

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

| **EN-DC**  **configuration** | **Uplink EN-DC**  **configuration**  **(NOTE 1)** |
| --- | --- |
| DC\_1A-28A\_n20A22 | DC\_1A\_n20A  DC\_28A\_n20A22 |
| NOTE 22: The frequency range in band 28 is restricted for this band combination to 703 - 733 MHz for the UL and 758 - 788 MHz for the DL. | |

### 5.29.2 Co-existence studies

Table 5.29.2-1 lists the Band 1A + Band n20A 2UL DC 2nd and 3rd order harmonics and 2nd, 3rd, 4th and 5th order IMD for the UE-to-UE coexistence analysis.

Table 5.29.2-1: Band 1 and Band n20 UL harmonics and IMD products

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **UE UL carriers** | **fx\_low** | **fx\_high** | | **fn\_low** | **fn\_high** | |
| UL frequency (MHz) | 1920 | 1980 | | 832 | 862 | |
| 2nd harmonics frequency limits | 2\*fx\_low | 2\*fx\_high | | 2\* fn\_low | 2\* fn\_high | |
| 2nd harmonics frequency limits (MHz) | 3840 – 3960 | | | 1664 – 1724 | | |
| 3rd harmonics frequency limits | 3\*fx\_low | | 3\*fx\_high | 3\* fn\_low | | 3\* fn\_high |
| 3rd harmonics frequency limits (MHz) | 5760 – 5940 | | | 2496 – 2586 | | |
| 2nd order IMD products | |fn\_low – fx\_high| | |fn\_high – fx\_low| | | |fn\_low + fx\_low| | |fn\_high + fx\_high| | |
| IMD frequency limits (MHz) | 1058 – 1148 | | | 2752 – 2842 | | |
| Two-tone 3rd order IMD products | |2\*fx\_low – fn\_high| | |2\*fx\_high – fn\_low| | | |2\*fn\_low – fx\_high| | |2\*fn\_high – fx\_low| | |
| IMD frequency limits (MHz) | 2978 – 3128 | | | 196 – 316 | | |
| Two-tone 3rd order IMD products | |2\*fx\_low + fn\_low| | |2\*fx\_high + fn\_high| | | |2\*fn\_low + fx\_low| | |2\*fn\_high + fx\_high| | |
| IMD frequency limits (MHz) | 4672 – 4822 | | | 3584 – 3704 | | |
| Two-tone 3rd order IMD products | (fx\_low – max BW fn) | | (fx\_high + max BW fn) | (fn\_low – max BW fx) | | (fn\_high + max BW fx) |
| IMD frequency limits (MHz) | 1900 – 2000 | | | 812 – 882 | | |
| Two-tone 4th order IMD products | |3\*fx\_low –1\* fn\_high| | | |3\*fx\_high – 1\*fn\_low| | |3\*fn\_low – 1\*fx\_high| | | |3\*fn\_high – 1\*fx\_low| |
| IMD frequency limits (MHz) | 4898 – 5108 | | | 516 – 666 | | |
| Two-tone 4th order IMD products | |2\*fx\_low –2\* fn\_high| | | |2\*fx\_high –2\* fn\_low| | |2\*fx\_low +2\* fn\_low| | | |2\*fx\_high +2\* fn\_high| |
| IMD frequency limits (MHz) | 2116 – 2296 | | | 5504 – 5684 | | |
| Two-tone 4th order IMD products | |3\*fx\_low +1\* fn\_low| | | |3\*fx\_high + 1\*fn\_high| | |3\*fn\_low + 1\*fx\_low| | | |3\*fn\_high + 1\*fx\_high| |
| IMD frequency limits (MHz) | 6592 – 6802 | | | 4416 – 4566 | | |
| Two-tone 5th order IMD products | |fx\_low – 4\*fn\_high| | | |fx\_high – 4\*fn\_low| | |fn\_low – 4\*fx\_high| | | |fn\_high – 4\*fx\_low| |
| IMD frequency limits (MHz) | 1348 – 1528 | | | 6818 – 7088 | | |
| Two-tone 5th order IMD products | |2\*fx\_low - 3\*fn\_high| | | |2\*fx\_high - 3\*fn\_low| | |2\*fn\_low - 3\*fx\_high| | | |2\*fn\_high -3\*fx\_low| |
| IMD frequency limits (MHz) | 1254 – 1464 | | | 4036 – 4276 | | |
| Two-tone 5th order IMD products | |fx\_low + 4\*fn\_low| | | |fx\_high + 4\*fn\_high| | |fn\_low + 4\*fx\_low| | | |fn\_high + 4\*fx\_high| |
| IMD frequency limits (MHz) | 5248 – 5428 | | | 8512 – 8782 | | |
| Two-tone 5th order IMD products | |2\*fx\_low + 3\*fn\_low| | | |2\*fx\_high + 3\*fn\_high| | |2\*fn\_low + 3\*fx\_low| | | |2\*fn\_high + 3\*fx\_high| |
| IMD frequency limits (MHz) | 6336 – 6546 | | | 7424 – 7664 | | |

Based on Table 5.29.2-1,

- 2nd order harmonics may fall into Rx frequencies of bands 46 and 47.

- 3rd order harmonics may fall into Rx frequencies of bands 38, 41, 69, 77 and 90.

- 3rd order IMD may fall into Rx frequencies of bands 22, 42, 43, 48, 49, 77, 78 and 79.

- 4th order IMD may fall into Rx frequencies of bands 1, 4, 10, 23, 46, 65, 66, 71 and 79.

- 5th order IMD may fall into Rx frequencies of bands 11, 21, 24, 32, 45, 46, 50, 51, 74, 75, 76, 77, 91, 92, 93 and 94.

When a 2UL inter-band DC UE is operating with other systems such as Wi-Fi, Bluetooth and GNSS, the harmonics and intermodulation products can have an impact on these systems. Table 5.29.2-2 lists if up to 3rd order harmonics and IMD up to 5th order falls into one of these receiving bands.

Table 5.29.2-2: 2UL Band 1 + Band n20 harmonic and IMD for ISM and GNSS bands

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Victim Systems** | **Frequency range [MHz]** | | | **Impact** | **Regions** | **Comments** |
| COMPASS  (Beidou) | 1559 | - | 1591 | No |  |  |
| Galileo | 1559 | - | 1591 | No |  |  |
| GLONASS | 1591 | - | 1610 | No |  |  |
| GPS | 1563 | - | 1587 | No |  |  |
| ISM band  (2.4GHz) | 2400 | - | 2483.5 | No | US/Europe |  |
| 2400 | - | 2494 | No | Asia |  |
| ISM band  (5GHz) | 5150 | - | 5925 | Yes | US | 2nd harmonic, IMD4, IMD5 |
| 5150 | - | 5350 | Yes | Europe | IMD5 |
| 5470 | - | 5725 | Yes | IMD4 |
| 5150 | - | 5825 | Yes | Asia | 2nd harmonic, IMD4, IMD5 |

The requirements for spurious emission band UE coexistence already exist in 38.101-3 for DC\_1\_n20.

Table 5.29.2-3 lists the Band 28A + Band n20A 2UL DC 2nd and 3rd order harmonics and 2nd, 3rd, 4th and 5th order IMD for the UE-to-UE coexistence analysis.

Table 5.29.2-3: Band 28 and Band n20 UL harmonics and IMD products

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **UE UL carriers** | **fx\_low** | **fx\_high** | | **fn\_low** | **fn\_high** | |
| UL frequency (MHz) | 703 | 733 | | 832 | 862 | |
| 2nd harmonics frequency limits | 2\*fx\_low | 2\*fx\_high | | 2\* fn\_low | 2\* fn\_high | |
| 2nd harmonics frequency limits (MHz) | 1406 – 1466 | | | 1664 – 1724 | | |
| 3rd harmonics frequency limits | 3\*fx\_low | | 3\*fx\_high | 3\* fn\_low | | 3\* fn\_high |
| 3rd harmonics frequency limits (MHz) | 2109 – 2199 | | | 2496 – 2586 | | |
| 2nd order IMD products | |fn\_low – fx\_high| | |fn\_high – fx\_low| | | |fn\_low + fx\_low| | |fn\_high + fx\_high| | |
| IMD frequency limits (MHz) | 99 – 159 | | | 1535 – 1595 | | |
| Two-tone 3rd order IMD products | |2\*fx\_low – fn\_high| | |2\*fx\_high – fn\_low| | | |2\*fn\_low – fx\_high| | |2\*fn\_high – fx\_low| | |
| IMD frequency limits (MHz) | 544 – 634 | | | 931 – 1021 | | |
| Two-tone 3rd order IMD products | |2\*fx\_low + fn\_low| | |2\*fx\_high + fn\_high| | | |2\*fn\_low + fx\_low| | |2\*fn\_high + fx\_high| | |
| IMD frequency limits (MHz) | 2238 – 2328 | | | 2367 – 2457 | | |
| Two-tone 3rd order IMD products | (fx\_low – max BW fn) | | (fx\_high + max BW fn) | (fn\_low – max BW fx) | | (fn\_high + max BW fx) |
| IMD frequency limits (MHz) | 683 – 753 | | | 812 – 882 | | |
| Two-tone 4th order IMD products | |3\*fx\_low –1\* fn\_high| | | |3\*fx\_high – 1\*fn\_low| | |3\*fn\_low – 1\*fx\_high| | | |3\*fn\_high – 1\*fx\_low| |
| IMD frequency limits (MHz) | 1247 – 1367 | | | 1763 – 1883 | | |
| Two-tone 4th order IMD products | |2\*fx\_low –2\* fn\_high| | | |2\*fx\_high –2\* fn\_low| | |2\*fx\_low +2\* fn\_low| | | |2\*fx\_high +2\* fn\_high| |
| IMD frequency limits (MHz) | 198 – 318 | | | 3070 – 3190 | | |
| Two-tone 4th order IMD products | |3\*fx\_low +1\* fn\_low| | | |3\*fx\_high + 1\*fn\_high| | |3\*fn\_low + 1\*fx\_low| | | |3\*fn\_high + 1\*fx\_high| |
| IMD frequency limits (MHz) | 2941 – 3061 | | | 3199 – 3319 | | |
| Two-tone 5th order IMD products | |fx\_low – 4\*fn\_high| | | |fx\_high – 4\*fn\_low| | |fn\_low – 4\*fx\_high| | | |fn\_high – 4\*fx\_low| |
| IMD frequency limits (MHz) | 2595 – 2745 | | | 1950 – 2100 | | |
| Two-tone 5th order IMD products | |2\*fx\_low - 3\*fn\_high| | | |2\*fx\_high - 3\*fn\_low| | |2\*fn\_low - 3\*fx\_high| | | |2\*fn\_high -3\*fx\_low| |
| IMD frequency limits (MHz) | 1030 – 1180 | | | 385 – 535 | | |
| Two-tone 5th order IMD products | |fx\_low + 4\*fn\_low| | | |fx\_high + 4\*fn\_high| | |fn\_low + 4\*fx\_low| | | |fn\_high + 4\*fx\_high| |
| IMD frequency limits (MHz) | 4031 – 4181 | | | 3644 – 3794 | | |
| Two-tone 5th order IMD products | |2\*fx\_low + 3\*fn\_low| | | |2\*fx\_high + 3\*fn\_high| | |2\*fn\_low + 3\*fx\_low| | | |2\*fn\_high + 3\*fx\_high| |
| IMD frequency limits (MHz) | 3902 – 4052 | | | 3773 – 3923 | | |

Based on Table 5.29.2-3,

- 2nd order harmonics may fall into Rx frequencies of bands 32, 38, 41, 45, 50, 51, 69, 75, 76, 90, 91, 92, 93 and 94.

- 3rd order harmonics may fall into Rx frequencies of bands 1, 4, 10, 23, 65 and 66.

- 2nd order IMD may fall into Rx frequencies of band 24.

- 3rd order IMD may fall into Rx frequencies of bands 8, 40 and 71.

- 4th order IMD may fall into Rx frequencies of bands 3, 9, 35, 39, 52, 77 and 78.

- 5th order IMD may fall into Rx frequencies of bands 2, 7, 25, 31, 34, 36, 38, 41, 43, 48, 49, 69, 70, 72, 73, 77, 78, 87, 88 and 90.

When a 2UL inter-band DC UE is operating with other systems such as Wi-Fi, Bluetooth and GNSS, the harmonics and intermodulation products can have an impact on these systems. Table 5.29.2-4 lists if up to 3rd order harmonics and IMD up to 5th order falls into one of these receiving bands.

Table 5.29.2-4: 2UL Band 28 + Band n20 harmonic and IMD for ISM and GNSS bands

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Victim Systems** | **Frequency range [MHz]** | | | **Impact** | **Regions** | **Comments** |
| COMPASS  (Beidou) | 1559 | - | 1591 | Yes |  | IMD2 |
| Galileo | 1559 | - | 1591 | Yes |  | IMD2 |
| GLONASS | 1591 | - | 1610 | Yes |  | IMD2 |
| GPS | 1563 | - | 1587 | Yes |  | IMD2 |
| ISM band  (2.4GHz) | 2400 | - | 2483.5 | Yes | US/Europe | IMD3 |
| 2400 | - | 2494 | Yes | Asia | IMD3 |
| ISM band  (5GHz) | 5150 | - | 5925 | No | US |  |
| 5150 | - | 5350 | No | Europe |  |
| 5470 | - | 5725 | No |  |
| 5150 | - | 5825 | No | Asia |  |

The requirements for spurious emission band UE coexistence that exist in 38.101-3 for DC\_20\_n28 can be reused.

### 5.29.3 ∆TIB and ∆RIB values

Table 5.29.3-1: ΔTIB,c

| Inter-band EN-DC configuration | ΔTIB,c for E-UTRA band / NR band (dB)6 | | |
| --- | --- | --- | --- |
| Component band in order of bands in configuration7 | | |
| DC\_1-28\_n20 | 0.3 | 0.6 | 0.6 |

**Table 5.29.3-2: ΔRIB**

| **Inter-band EN-DC configuration** | ΔRIB,c for E-UTRA band / NR band (dB)7 | | |
| --- | --- | --- | --- |
| Component band in order of bands in configuration8 | | |
| DC\_1-28\_n20 | 0 | 0.2 | 0.2 |

### 5.29.4 Reference sensitivity exceptions

No additional sensitivity exceptions required compared to fallbacks.

## 5.30 DC\_1-5\_n40

5.30.1 Configurations for DC

**Table 5.30.1-1: Inter-band DC configurations (three bands)**

| **DC**  **Configuration** | **Uplink DC**  **configuration** |
| --- | --- |
| DC\_1A-5A\_n40A | DC\_1A\_n40A DC\_5A\_n40A |

5.30.2 Co-existence studies

For UE coexistence study of Band 1 + Band n40, the 2nd, 3rd, 4th, and 5th order harmonics and 2nd, 3rd, 4th and 5th order intermodulation products were calculated and presented in Table 5.30.2-1

**Table 5.30.2-1: Harmonic and IMD analysis**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Fx low | Fx high | Fy low | Fy high |
| UL Frequency [MHz] | 1920 | 1980 | 2300 | 2400 |
| 2nd harmonics frequency limits | 2\*fx\_low | 2\*fx\_high | 2\* fy\_low | 2\* fy\_high |
| 2nd harmonics frequency limits (MHz) | 3840 | 3960 | 4600 | 4800 |
| 3rd harmonics frequency limits | 3\*fx\_low | 3\*fx\_high | 3\* fy\_low | 3\* fy\_high |
| 3rd harmonics frequency limits (MHz) | 5760 | 5940 | 6900 | 7200 |
| 4th harmonics frequency limits | 4\*fx\_low | 4\*fx\_high | 4\* fy\_low | 4\* fy\_high |
| 4th harmonics frequency limits (MHz) | 7680 | 7920 | 9200 | 9600 |
| 5th harmonics frequency limits | 5\*fx\_low | 5\*fx\_high | 5\* fy\_low | 5\* fy\_high |
| 5th harmonics frequency limits (MHz) | 9600 | 9900 | 11500 | 12000 |
| Two tone 2nd order IMD products | |fy\_low – fx\_high| | |fy\_high – fx\_low| | |fy\_low + fx\_low| | |fy\_high + fx\_high| |
| IMD frequency limits (MHz) | 320 | 480 | 4220 | 4380 |
| Two tone 3rd order IMD products | |2\*fx\_low – fy\_high| | |2\*fx\_high – fy\_low| | |2\*fy\_low – fx\_high| | |2\*fy\_high – fx\_low| |
| IMD frequency limits (MHz) | 1440 | 1660 | 2620 | 2880 |
| Two tone 3rd order IMD products | |2\*fx\_low + fy\_low| | |2\*fx\_high + fy\_high| | |2\*fy\_low + fx\_low| | |2\*fy\_high + fx\_high| |
| IMD frequency limits (MHz) | 6140 | 6360 | 6520 | 6780 |
| Two-tone 4th order IMD products | |3\*fx\_low –1\* fy\_high| | |3\*fx\_high – 1\*fy\_low| | |3\*fy\_low – 1\*fx\_high| | |3\*fy\_high – 1\*fx\_low| |
| IMD frequency limits (MHz) | 3360 | 3640 | 4920 | 5280 |
| Two-tone 4th order IMD products | |2\*fx\_low –2\* fy\_high| | |2\*fx\_high –2\* fy\_low| | |2\*fx\_low +2\* fy\_low| | |2\*fx\_high +2\* fy\_high| |
| IMD frequency limits (MHz) | 960 | 640 | 8440 | 8760 |
| Two-tone 4th order IMD products | |3\*fx\_low +1\* fy\_low| | |3\*fx\_high + 1\*fy\_high| | |3\*fy\_low + 1\*fx\_low| | |3\*fy\_high + 1\*fx\_high| |
| IMD frequency limits (MHz) | 8060 | 8340 | 8820 | 9180 |
| Two-tone 5th order IMD products | |fx\_low – 4\*fy\_high| | |fx\_high – 4\*fy\_low| | |fy\_low – 4\*fx\_high| | |fy\_high – 4\*fx\_low| |
| IMD frequency limits (MHz) | 7680 | 7220 | 5620 | 5280 |
| Two-tone 5th order IMD products | |2\*fx\_low - 3\*fy\_high| | |2\*fx\_high - 3\*fy\_low| | |2\*fy\_low - 3\*fx\_high| | |2\*fy\_high -3\*fx\_low| |
| IMD frequency limits (MHz) | 3360 | 2940 | 1340 | 960 |
| Two-tone 5th order IMD products | |fx\_low + 4\*fy\_low| | |fx\_high + 4\*fy\_high| | |fy\_low + 4\*fx\_low| | |fy\_high + 4\*fx\_high| |
| IMD frequency limits (MHz) | 11120 | 11580 | 9980 | 10320 |
| Two-tone 5th order IMD products | |2\*fx\_low + 3\*fy\_low| | |2\*fx\_high + 3\*fy\_high| | |2\*fy\_low + 3\*fx\_low| | |2\*fy\_high + 3\*fx\_high| |
| IMD frequency limits (MHz) | 10740 | 11160 | 10360 | 10740 |

For UE coexistence study of Band 5 + Band n40, the 2nd, 3rd, 4th, and 5th order harmonics and 2nd, 3rd, 4th and 5th order intermodulation products were calculated and presented in Table 5.30.2-2

**Table 5.216.2-2: Harmonic and IMD analysis**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Fx low | Fx high | Fy low | Fy high |
| UL Frequency [MHz] | 824 | 849 | 2300 | 2400 |
| 2nd harmonics frequency limits | 2\*fx\_low | 2\*fx\_high | 2\* fy\_low | 2\* fy\_high |
| 2nd harmonics frequency limits (MHz) | 1648 | 1698 | 4600 | 4800 |
| 3rd harmonics frequency limits | 3\*fx\_low | 3\*fx\_high | 3\* fy\_low | 3\* fy\_high |
| 3rd harmonics frequency limits (MHz) | 2472 | 2547 | 6900 | 7200 |
| 4th harmonics frequency limits | 4\*fx\_low | 4\*fx\_high | 4\* fy\_low | 4\* fy\_high |
| 4th harmonics frequency limits (MHz) | 3296 | 3396 | 9200 | 9600 |
| 5th harmonics frequency limits | 5\*fx\_low | 5\*fx\_high | 5\* fy\_low | 5\* fy\_high |
| 5th harmonics frequency limits (MHz) | 4120 | 4245 | 11500 | 12000 |
| Two tone 2nd order IMD products | |fy\_low – fx\_high| | |fy\_high – fx\_low| | |fy\_low + fx\_low| | |fy\_high + fx\_high| |
| IMD frequency limits (MHz) | 1451 | 1576 | 3124 | 3249 |
| Two tone 3rd order IMD products | |2\*fx\_low – fy\_high| | |2\*fx\_high – fy\_low| | |2\*fy\_low – fx\_high| | |2\*fy\_high – fx\_low| |
| IMD frequency limits (MHz) | 752 | 602 | 3751 | 3976 |
| Two tone 3rd order IMD products | |2\*fx\_low + fy\_low| | |2\*fx\_high + fy\_high| | |2\*fy\_low + fx\_low| | |2\*fy\_high + fx\_high| |
| IMD frequency limits (MHz) | 3948 | 4098 | 5424 | 5649 |
| Two-tone 4th order IMD products | |3\*fx\_low –1\* fy\_high| | |3\*fx\_high – 1\*fy\_low| | |3\*fy\_low – 1\*fx\_high| | |3\*fy\_high – 1\*fx\_low| |
| IMD frequency limits (MHz) | 72 | 247 | 6051 | 6376 |
| Two-tone 4th order IMD products | |2\*fx\_low –2\* fy\_high| | |2\*fx\_high –2\* fy\_low| | |2\*fx\_low +2\* fy\_low| | |2\*fx\_high +2\* fy\_high| |
| IMD frequency limits (MHz) | 3152 | 2902 | 6248 | 6498 |
| Two-tone 4th order IMD products | |3\*fx\_low +1\* fy\_low| | |3\*fx\_high + 1\*fy\_high| | |3\*fy\_low + 1\*fx\_low| | |3\*fy\_high + 1\*fx\_high| |
| IMD frequency limits (MHz) | 4772 | 4947 | 7724 | 8049 |
| Two-tone 5th order IMD products | |fx\_low – 4\*fy\_high| | |fx\_high – 4\*fy\_low| | |fy\_low – 4\*fx\_high| | |fy\_high – 4\*fx\_low| |
| IMD frequency limits (MHz) | 8776 | 8351 | 1096 | 896 |
| Two-tone 5th order IMD products | |2\*fx\_low - 3\*fy\_high| | |2\*fx\_high - 3\*fy\_low| | |2\*fy\_low - 3\*fx\_high| | |2\*fy\_high -3\*fx\_low| |
| IMD frequency limits (MHz) | 5552 | 5202 | 2053 | 2328 |
| Two-tone 5th order IMD products | |fx\_low + 4\*fy\_low| | |fx\_high + 4\*fy\_high| | |fy\_low + 4\*fx\_low| | |fy\_high + 4\*fx\_high| |
| IMD frequency limits (MHz) | 10024 | 10449 | 5596 | 5796 |
| Two-tone 5th order IMD products | |2\*fx\_low + 3\*fy\_low| | |2\*fx\_high + 3\*fy\_high| | |2\*fy\_low + 3\*fx\_low| | |2\*fy\_high + 3\*fx\_high| |
| IMD frequency limits (MHz) | 8548 | 8898 | 7072 | 7347 |

The Rx impacts can be identified as below.

* Co-existence analysis for DC\_1\_n40 UL shows that 4th IMD may fall in DL band 5.
* Co-existence analysis for DC\_5\_n40 UL shows that 5th IMD may fall in DL band 1.

5.30.3 ∆TIB and ∆RIB values

For DC\_1-5\_n40, the ΔTIB,c and ΔRIB,c values are reused from DC\_1-28\_n40 which is very similar

**Table 5.30.3-1: ΔTIB,c**

| Inter-band EN-DC configuration | ΔTIB,c for E-UTRA band / NR band (dB)6 | | |
| --- | --- | --- | --- |
| Component band in order of bands in configuration7 | | |
| DC\_1-5\_n40 | 0.6 | 0.3 | 0.5 |

**Table 5.30.3-2: ΔRIB**

| **Inter-band EN-DC configuration** | ΔRIB,c for E-UTRA band / NR band (dB)7 | | |
| --- | --- | --- | --- |
| Component band in order of bands in configuration8 | | |
| DC\_1-5\_n40 | 0 | 0.2 | 0 |

5.30.4 Reference sensitivity exceptions

The MSD requirement due to 5th order IMD for DC\_5-66\_n30 can be reused for DC\_1-5\_n40.

The MSD requirement due to 4th order IMD for DC\_1-8\_n40 can be reused for DC\_1-5\_n40.

**Table 6.x.5-1: MSD test points for Scell due to dual uplink operation for EN-DC in NR FR1 (three bands)**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **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-5A\_n40A | 1 | 1954 | 5 | 25 | 2144 | 4.0 | IMD5 |
| 5 | 832 | 5 | 25 | 877 | N/A | N/A |
| n40 | 2320 | 5 | 25 | 2320 | N/A | N/A |
| 1 | 1945 | 5 | 25 | 2135 | N/A | N/A |
| 5 | 835 | 5 | 25 | 880 | 8.0 | IMD4 |
| n40 | 2385 | 5 | 25 | 2385 | N/A | N/A |

## 5.31 DC\_1-3\_n1

5.31.1 Configurations for DC

**Table 5.31.1-1: Inter-band DC configurations (three bands)**

| **EN-DC**  **configuration** | **Uplink EN-DC**  **configuration**  **(NOTE 1)** |
| --- | --- |
| DC\_1A-3A\_n1A | DC\_1A\_n1A2  DC\_3A\_n1A |
| NOTE 2: Only single switched UL is supported. | |

5.31.2 Co-existence studies

Table 5.31.2-1 lists the Band 3A + Band n1A 2UL DC 2nd and 3rd order harmonics and 2nd, 3rd, 4th and 5th order IMD for the UE-to-UE coexistence analysis.

**Table 5.31.2-1: Band 3 and Band n1 UL harmonics and IMD products**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **UE UL carriers** | **fx\_low** | **fx\_high** | | **fn\_low** | **fn\_high** | |
| UL frequency (MHz) | 1710 | 1785 | | 1920 | 1980 | |
| 2nd harmonics frequency limits | 2\*fx\_low | 2\*fx\_high | | 2\* fn\_low | 2\* fn\_high | |
| 2nd harmonics frequency limits (MHz) | 3420 – 3570 | | | 3840 – 3960 | | |
| 3rd harmonics frequency limits | 3\*fx\_low | | 3\*fx\_high | 3\* fn\_low | | 3\* fn\_high |
| 3rd harmonics frequency limits (MHz) | 5130 – 5355 | | | 5760 – 5940 | | |
| 2nd order IMD products | |fn\_low – fx\_high| | |fn\_high – fx\_low| | | |fn\_low + fx\_low| | |fn\_high + fx\_high| | |
| IMD frequency limits (MHz) | 135 – 270 | | | 3630 – 3765 | | |
| Two-tone 3rd order IMD products | |2\*fx\_low – fn\_high| | |2\*fx\_high – fn\_low| | | |2\*fn\_low – fx\_high| | |2\*fn\_high – fx\_low| | |
| IMD frequency limits (MHz) | 1440 – 1650 | | | 2055 – 2250 | | |
| Two-tone 3rd order IMD products | |2\*fx\_low + fn\_low| | |2\*fx\_high + fn\_high| | | |2\*fn\_low + fx\_low| | |2\*fn\_high + fx\_high| | |
| IMD frequency limits (MHz) | 5340 – 5550 | | | 5550 – 5745 | | |
| Two-tone 3rd order IMD products | (fx\_low – max BW fn) | | (fx\_high + max BW fn) | (fn\_low – max BW fx) | | (fn\_high + max BW fx) |
| IMD frequency limits (MHz) | 1660 – 1835 | | | 1900 – 2000 | | |
| Two-tone 4th order IMD products | |3\*fx\_low –1\* fn\_high| | | |3\*fx\_high – 1\*fn\_low| | |3\*fn\_low – 1\*fx\_high| | | |3\*fn\_high – 1\*fx\_low| |
| IMD frequency limits (MHz) | 3150 – 3435 | | | 3975 – 4230 | | |
| Two-tone 4th order IMD products | |2\*fx\_low –2\* fn\_high| | | |2\*fx\_high –2\* fn\_low| | |2\*fx\_low +2\* fn\_low| | | |2\*fx\_high +2\* fn\_high| |
| IMD frequency limits (MHz) | 270 – 540 | | | 7260 – 7530 | | |
| Two-tone 4th order IMD products | |3\*fx\_low +1\* fn\_low| | | |3\*fx\_high + 1\*fn\_high| | |3\*fn\_low + 1\*fx\_low| | | |3\*fn\_high + 1\*fx\_high| |
| IMD frequency limits (MHz) | 7050 – 7335 | | | 7470 – 7725 | | |
| Two-tone 5th order IMD products | |fx\_low – 4\*fn\_high| | | |fx\_high – 4\*fn\_low| | |fn\_low – 4\*fx\_high| | | |fn\_high – 4\*fx\_low| |
| IMD frequency limits (MHz) | 5895 – 6210 | | | 4860 – 5220 | | |
| Two-tone 5th order IMD products | |2\*fx\_low - 3\*fn\_high| | | |2\*fx\_high - 3\*fn\_low| | |2\*fn\_low - 3\*fx\_high| | | |2\*fn\_high -3\*fx\_low| |
| IMD frequency limits (MHz) | 2190 – 2520 | | | 1170 – 1515 | | |
| Two-tone 5th order IMD products | |fx\_low + 4\*fn\_low| | | |fx\_high + 4\*fn\_high| | |fn\_low + 4\*fx\_low| | | |fn\_high + 4\*fx\_high| |
| IMD frequency limits (MHz) | 9390 – 9705 | | | 8760 – 9120 | | |
| Two-tone 5th order IMD products | |2\*fx\_low + 3\*fn\_low| | | |2\*fx\_high + 3\*fn\_high| | |2\*fn\_low + 3\*fx\_low| | | |2\*fn\_high + 3\*fx\_high| |
| IMD frequency limits (MHz) | 9180 – 9510 | | | 8970 – 9315 | | |

Based on Table 5.31.2-1,

- 2nd order harmonics may fall into Rx frequencies of band 22, 42, 46, 47, 48, 49, 77 and 78.

- 3rd order harmonics may fall into Rx frequencies of band 46 and 77

- 2nd order IMD may fall into Rx frequencies of bands 43, 48, 49, 77 and 78.

- 3rd order IMD may fall into Rx frequencies of bands 1, 4, 10, 11, 21, 23, 24, 32, 45, 46, 50, 65, 66, 74, 75, 92 and 94.

- 4th order IMD may fall into Rx frequencies of bands 31, 42, 52, 72, 73, 77, 78, 87 and 88

- 5th order IMD may fall into Rx frequencies of bands 11, 21, 23, 30, 32, 40, 41, 45, 46, 47, 50, 51, 53, 65, 66, 74, 75, 76, 79, 90, 91, 92, 93 and 94.

When a 2UL inter-band DC UE is operating with other systems such as Wi-Fi, Bluetooth and GNSS, the harmonics and intermodulation products can have an impact on these systems. Table 5.31.2-2 lists if up to 3rd order harmonics and IMD up to 5th order falls into one of these receiving bands.

**Table 5.31.2-2: 2UL Band 3 + Band n1 harmonic and IMD for ISM and GNSS bands**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Victim Systems** | **Frequency range [MHz]** | | | **Impact** | **Regions** | **Comments** |
| COMPASS  (Beidou) | 1559 | - | 1591 | Yes |  | IMD3 |
| Galileo | 1559 | - | 1591 | Yes |  | IMD3 |
| GLONASS | 1591 | - | 1610 | Yes |  | IMD3 |
| GPS | 1563 | - | 1587 | Yes |  | IMD3 |
| ISM band  (2.4GHz) | 2400 | - | 2483.5 | Yes | US/Europe | IMD5 |
| 2400 | - | 2494 | Yes | Asia | IMD5 |
| ISM band  (5GHz) | 5150 | - | 5925 | Yes | US | 2nd harmonic, 3rd harmonic, IMD3, IMD5 |
| 5150 | - | 5350 | Yes | Europe | 3rd harmonic, IMD3, IMD5 |
| 5470 | - | 5725 | Yes | IMD3 |
| 5150 | - | 5825 | Yes | Asia | 2nd harmonic, 3rd harmonic, IMD3, IMD5 |

The requirements for spurious emission band UE coexistence already exist in 38.101-3 for DC\_3\_n1.

5.31.3 ∆TIB and ∆RIB values

**Table 5.31.3-1: ΔTIB,c**

| Inter-band EN-DC configuration | ΔTIB,c for E-UTRA band / NR band (dB)6 | | |
| --- | --- | --- | --- |
| Component band in order of bands in configuration7 | | |
| DC\_1-3\_n1 | 0.3 | 0.3 | 0.3 |

5.31.4 Reference sensitivity exceptions

**Table 5.31.4-1: 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\_n1A | n1 | 1950 | 5 | 25 | 2140 | N/A | N/A |
| 3 | 1750 | 5 | 25 | 1845 | N/A | N/A |
| 1 | N/A | 5 | N/A | 2150 | 23 | IMD3 |

## 5.32 DC\_1-20\_n1

5.32.1 Configurations for DC

**Table 5.32.1-1: Inter-band DC configurations (three bands)**

| **EN-DC**  **configuration** | **Uplink EN-DC**  **configuration**  **(NOTE 1)** |
| --- | --- |
| DC\_1A-20A\_n1A | DC\_1A\_n1A2  DC\_20A\_n1A |
| NOTE 2: Only single switched UL is supported. | |

5.32.2 Co-existence studies

Table 5.32.2-1 lists the Band 20A + Band n1A 2UL DC 2nd and 3rd order harmonics and 2nd, 3rd, 4th and 5th order IMD for the UE-to-UE coexistence analysis.

**Table 5.32.2-1: Band 20 and Band n1 UL harmonics and IMD products**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **UE UL carriers** | **fx\_low** | **fx\_high** | | **fn\_low** | **fn\_high** | |
| UL frequency (MHz) | 832 | 862 | | 1920 | 1980 | |
| 2nd harmonics frequency limits | 2\*fx\_low | 2\*fx\_high | | 2\* fn\_low | 2\* fn\_high | |
| 2nd harmonics frequency limits (MHz) | 1664 – 1724 | | | 3840 – 3960 | | |
| 3rd harmonics frequency limits | 3\*fx\_low | | 3\*fx\_high | 3\* fn\_low | | 3\* fn\_high |
| 3rd harmonics frequency limits (MHz) | 2496 – 2586 | | | 5760 – 5940 | | |
| 2nd order IMD products | |fn\_low – fx\_high| | |fn\_high – fx\_low| | | |fn\_low + fx\_low| | |fn\_high + fx\_high| | |
| IMD frequency limits (MHz) | 1058 – 1148 | | | 2752 – 2842 | | |
| Two-tone 3rd order IMD products | |2\*fx\_low – fn\_high| | |2\*fx\_high – fn\_low| | | |2\*fn\_low – fx\_high| | |2\*fn\_high – fx\_low| | |
| IMD frequency limits (MHz) | 196 – 316 | | | 2978 – 3128 | | |
| Two-tone 3rd order IMD products | |2\*fx\_low + fn\_low| | |2\*fx\_high + fn\_high| | | |2\*fn\_low + fx\_low| | |2\*fn\_high + fx\_high| | |
| IMD frequency limits (MHz) | 3584 – 3704 | | | 4672 – 4822 | | |
| Two-tone 3rd order IMD products | (fx\_low – max BW fn) | | (fx\_high + max BW fn) | (fn\_low – max BW fx) | | (fn\_high + max BW fx) |
| IMD frequency limits (MHz) | 782 – 912 | | | 1900 – 2000 | | |
| Two-tone 4th order IMD products | |3\*fx\_low –1\* fn\_high| | | |3\*fx\_high – 1\*fn\_low| | |3\*fn\_low – 1\*fx\_high| | | |3\*fn\_high – 1\*fx\_low| |
| IMD frequency limits (MHz) | 516 – 666 | | | 4898 – 5108 | | |
| Two-tone 4th order IMD products | |2\*fx\_low –2\* fn\_high| | | |2\*fx\_high –2\* fn\_low| | |2\*fx\_low +2\* fn\_low| | | |2\*fx\_high +2\* fn\_high| |
| IMD frequency limits (MHz) | 2116 – 2296 | | | 5504 – 5684 | | |
| Two-tone 4th order IMD products | |3\*fx\_low +1\* fn\_low| | | |3\*fx\_high + 1\*fn\_high| | |3\*fn\_low + 1\*fx\_low| | | |3\*fn\_high + 1\*fx\_high| |
| IMD frequency limits (MHz) | 4416 – 4566 | | | 6592 – 6802 | | |
| Two-tone 5th order IMD products | |fx\_low – 4\*fn\_high| | | |fx\_high – 4\*fn\_low| | |fn\_low – 4\*fx\_high| | | |fn\_high – 4\*fx\_low| |
| IMD frequency limits (MHz) | 6818 – 7088 | | | 1348 – 1528 | | |
| Two-tone 5th order IMD products | |2\*fx\_low - 3\*fn\_high| | | |2\*fx\_high - 3\*fn\_low| | |2\*fn\_low - 3\*fx\_high| | | |2\*fn\_high -3\*fx\_low| |
| IMD frequency limits (MHz) | 4036 – 4276 | | | 1254 – 1464 | | |
| Two-tone 5th order IMD products | |fx\_low + 4\*fn\_low| | | |fx\_high + 4\*fn\_high| | |fn\_low + 4\*fx\_low| | | |fn\_high + 4\*fx\_high| |
| IMD frequency limits (MHz) | 8512 – 8782 | | | 5248 – 5428 | | |
| Two-tone 5th order IMD products | |2\*fx\_low + 3\*fn\_low| | | |2\*fx\_high + 3\*fn\_high| | |2\*fn\_low + 3\*fx\_low| | | |2\*fn\_high + 3\*fx\_high| |
| IMD frequency limits (MHz) | 7424 – 7664 | | | 6336 – 6546 | | |

Based on Table 5.32.2-1,

- 2nd order harmonics may fall into Rx frequencies of band 46 and 47.

- 3rd order harmonics may fall into Rx frequencies of bands 38, 41, 69, 77 and 90.

- 3rd order IMD may fall into Rx frequencies of bands 22, 42, 43, 48, 49, 77, 78 and 79.

- 4th order IMD may fall into Rx frequencies of bands 1, 4, 10, 23, 46, 65, 66, 71 and 79.

- 5th order IMD may fall into Rx frequencies of bands 11, 21, 24, 32, 45, 46, 50, 51, 74, 75, 76, 77, 91, 92, 93 and 94.

When a 2UL inter-band DC UE is operating with other systems such as Wi-Fi, Bluetooth and GNSS, the harmonics and intermodulation products can have an impact on these systems. Table 5.32.2-2 lists if up to 3rd order harmonics and IMD up to 5th order falls into one of these receiving bands.

**Table 5.32.2-2: 2UL Band 20 + Band n1 harmonic and IMD for ISM and GNSS bands**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Victim Systems** | **Frequency range [MHz]** | | | **Impact** | **Regions** | **Comments** |
| COMPASS  (Beidou) | 1559 | - | 1591 | No |  |  |
| Galileo | 1559 | - | 1591 | No |  |  |
| GLONASS | 1591 | - | 1610 | No |  |  |
| GPS | 1563 | - | 1587 | No |  |  |
| ISM band  (2.4GHz) | 2400 | - | 2483.5 | No | US/Europe |  |
| 2400 | - | 2494 | No | Asia |  |
| ISM band  (5GHz) | 5150 | - | 5925 | Yes | US | 2nd Harmonic, IMD4, IMD5 |
| 5150 | - | 5350 | Yes | Europe | IMD5 |
| 5470 | - | 5725 | Yes | IMD4 |
| 5150 | - | 5825 | Yes | Asia | 2nd Harmonic, IMD4, IMD5 |

The requirements for spurious emission band UE coexistence already exist in 38.101-3 for DC\_20\_n1.

5.32.3 ∆TIB and ∆RIB values

**Table 5.32.3-1: ΔTIB,c**

| Inter-band EN-DC configuration | ΔTIB,c for E-UTRA band / NR band (dB)6 | | |
| --- | --- | --- | --- |
| Component band in order of bands in configuration7 | | |
| DC\_1-20\_n1 | 0.3 | 0.3 | 0.3 |

5.32.4 Reference sensitivity exceptions

**Table 5.32.4-1: 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-20A\_n1A | n1 | 1930 | 5 | 25 | 2120 | N/A | N/A |
| 20 | 850 | 5 | 25 | 809 | N/A | N/A |
| 1 | N/A | 5 | N/A | 2160 | 6 | IMD4 |

## 5.33 DC\_7-8\_n20

5.33.1 Configurations for DC

**Table 5.33.1-1: Inter-band DC configurations (three bands)**

| **EN-DC**  **configuration** | **Uplink EN-DC**  **configuration**  **(NOTE 1)** |
| --- | --- |
| DC\_7A-8A\_n20A | DC\_7A\_n20A  DC\_8A\_n20A |

5.33.2 Co-existence studies

Table 5.33.2-1 lists the Band 7A + Band n20A 2UL DC 2nd and 3rd order harmonics and 2nd, 3rd, 4th and 5th order IMD for the UE-to-UE coexistence analysis.

**Table 5.33.2-1: Band 7 and Band n20 UL harmonics and IMD products**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **UE UL carriers** | **fx\_low** | **fx\_high** | | **fn\_low** | **fn\_high** | |
| UL frequency (MHz) | 2500 | 2570 | | 832 | 862 | |
| 2nd harmonics frequency limits | 2\*fx\_low | 2\*fx\_high | | 2\* fn\_low | 2\* fn\_high | |
| 2nd harmonics frequency limits (MHz) | 5000 – 5140 | | | 1664 – 1724 | | |
| 3rd harmonics frequency limits | 3\*fx\_low | | 3\*fx\_high | 3\* fn\_low | | 3\* fn\_high |
| 3rd harmonics frequency limits (MHz) | 7500 – 7710 | | | 2496 – 2586 | | |
| 2nd order IMD products | |fn\_low – fx\_high| | |fn\_high – fx\_low| | | |fn\_low + fx\_low| | |fn\_high + fx\_high| | |
| IMD frequency limits (MHz) | 1638 – 1738 | | | 3332 – 3432 | | |
| Two-tone 3rd order IMD products | |2\*fx\_low – fn\_high| | |2\*fx\_high – fn\_low| | | |2\*fn\_low – fx\_high| | |2\*fn\_high – fx\_low| | |
| IMD frequency limits (MHz) | 4138 – 4308 | | | 776 – 906 | | |
| Two-tone 3rd order IMD products | |2\*fx\_low + fn\_low| | |2\*fx\_high + fn\_high| | | |2\*fn\_low + fx\_low| | |2\*fn\_high + fx\_high| | |
| IMD frequency limits (MHz) | 5832 – 6002 | | | 4164 – 4294 | | |
| Two-tone 3rd order IMD products | (fx\_low – max BW fn) | | (fx\_high + max BW fn) | (fn\_low – max BW fx) | | (fn\_high + max BW fx) |
| IMD frequency limits (MHz) | 2480 – 2590 | | | 812 – 882 | | |
| Two-tone 4th order IMD products | |3\*fx\_low –1\* fn\_high| | | |3\*fx\_high – 1\*fn\_low| | |3\*fn\_low – 1\*fx\_high| | | |3\*fn\_high – 1\*fx\_low| |
| IMD frequency limits (MHz) | 6638 – 6878 | | | 74 – 86 | | |
| Two-tone 4th order IMD products | |2\*fx\_low –2\* fn\_high| | | |2\*fx\_high –2\* fn\_low| | |2\*fx\_low +2\* fn\_low| | | |2\*fx\_high +2\* fn\_high| |
| IMD frequency limits (MHz) | 3276 – 3476 | | | 6664 – 6864 | | |
| Two-tone 4th order IMD products | |3\*fx\_low +1\* fn\_low| | | |3\*fx\_high + 1\*fn\_high| | |3\*fn\_low + 1\*fx\_low| | | |3\*fn\_high + 1\*fx\_high| |
| IMD frequency limits (MHz) | 8332 – 8572 | | | 4996 – 5156 | | |
| Two-tone 5th order IMD products | |fx\_low – 4\*fn\_high| | | |fx\_high – 4\*fn\_low| | |fn\_low – 4\*fx\_high| | | |fn\_high – 4\*fx\_low| |
| IMD frequency limits (MHz) | 758 – 948 | | | 9138 – 9448 | | |
| Two-tone 5th order IMD products | |2\*fx\_low - 3\*fn\_high| | | |2\*fx\_high - 3\*fn\_low| | |2\*fn\_low - 3\*fx\_high| | | |2\*fn\_high -3\*fx\_low| |
| IMD frequency limits (MHz) | 2414 – 2644 | | | 5776 – 6046 | | |
| Two-tone 5th order IMD products | |fx\_low + 4\*fn\_low| | | |fx\_high + 4\*fn\_high| | |fn\_low + 4\*fx\_low| | | |fn\_high + 4\*fx\_high| |
| IMD frequency limits (MHz) | 5828 – 6018 | | | 10832 – 11142 | | |
| Two-tone 5th order IMD products | |2\*fx\_low + 3\*fn\_low| | | |2\*fx\_high + 3\*fn\_high| | |2\*fn\_low + 3\*fx\_low| | | |2\*fn\_high + 3\*fx\_high| |
| IMD frequency limits (MHz) | 7496 – 7726 | | | 9164 – 9434 | | |

Based on Table 5.33.2-1,

- 3rd order harmonics may fall into Rx frequencies of bands 38, 41, 69 and 90.

- 2nd order IMD may fall into Rx frequencies of bands 42, 52, 77 and 78.

- 3rd order IMD may fall into Rx frequencies of bands 5, 6, 18, 19, 20, 26, 27, 28, 44, 46, 47, 68 and 77.

- 4th order IMD may fall into Rx frequencies of bands 42, 46, 52, 77, 78 and 79.

- 5th order IMD may fall into Rx frequencies of bands 5, 6, 7, 8, 14, 18, 19, 20, 26, 27, 28, 38, 41, 44, 46, 47, 53, 68, 69 and 90.

When a 2UL inter-band DC UE is operating with other systems such as Wi-Fi, Bluetooth and GNSS, the harmonics and intermodulation products can have an impact on these systems. Table 5.33.2-2 lists if up to 3rd order harmonics and IMD up to 5th order falls into one of these receiving bands.

**Table 5.33.2-2: 2UL Band 7 + Band n20 harmonic and IMD for ISM and GNSS bands**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Victim Systems** | **Frequency range [MHz]** | | | **Impact** | **Regions** | **Comments** |
| COMPASS  (Beidou) | 1559 | - | 1591 | No |  |  |
| Galileo | 1559 | - | 1591 | No |  |  |
| GLONASS | 1591 | - | 1610 | No |  |  |
| GPS | 1563 | - | 1587 | No |  |  |
| ISM band  (2.4GHz) | 2400 | - | 2483.5 | Yes | US/Europe | IMD5 |
| 2400 | - | 2494 | Yes | Asia | IMD5 |
| ISM band  (5GHz) | 5150 | - | 5925 | Yes | US | IMD3, IMD4, IMD5 |
| 5150 | - | 5350 | Yes | Europe | IMD4 |
| 5470 | - | 5725 | No |  |
| 5150 | - | 5825 | Yes | Asia | IMD4, IMD5 |

The requirements for spurious emission band UE coexistence already exist in 38.101-3 for DC\_7\_n20.

Table 5.33.2-3 lists the Band 8A + Band n20A 2UL DC 2nd and 3rd order harmonics and 2nd, 3rd, 4th and 5th order IMD for the UE-to-UE coexistence analysis.

**Table 5.33.2-3: Band 8 and Band n20 UL harmonics and IMD products**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **UE UL carriers** | **fx\_low** | **fx\_high** | | **fn\_low** | **fn\_high** | |
| UL frequency (MHz) | 880 | 915 | | 832 | 862 | |
| 2nd harmonics frequency limits | 2\*fx\_low | 2\*fx\_high | | 2\* fn\_low | 2\* fn\_high | |
| 2nd harmonics frequency limits (MHz) | 1760 – 1830 | | | 1664 – 1724 | | |
| 3rd harmonics frequency limits | 3\*fx\_low | | 3\*fx\_high | 3\* fn\_low | | 3\* fn\_high |
| 3rd harmonics frequency limits (MHz) | 2640 – 2745 | | | 2496 – 2586 | | |
| 2nd order IMD products | |fn\_low – fx\_high| | |fn\_high – fx\_low| | | |fn\_low + fx\_low| | |fn\_high + fx\_high| | |
| IMD frequency limits (MHz) | 18 – 83 | | | 1712 – 1777 | | |
| Two-tone 3rd order IMD products | |2\*fx\_low – fn\_high| | |2\*fx\_high – fn\_low| | | |2\*fn\_low – fx\_high| | |2\*fn\_high – fx\_low| | |
| IMD frequency limits (MHz) | 898 – 998 | | | 749 – 844 | | |
| Two-tone 3rd order IMD products | |2\*fx\_low + fn\_low| | |2\*fx\_high + fn\_high| | | |2\*fn\_low + fx\_low| | |2\*fn\_high + fx\_high| | |
| IMD frequency limits (MHz) | 2592 – 2692 | | | 2544 – 2639 | | |
| Two-tone 3rd order IMD products | (fx\_low – max BW fn) | | (fx\_high + max BW fn) | (fn\_low – max BW fx) | | (fn\_high + max BW fx) |
| IMD frequency limits (MHz) | 860 – 935 | | | 822 – 872 | | |
| Two-tone 4th order IMD products | |3\*fx\_low –1\* fn\_high| | | |3\*fx\_high – 1\*fn\_low| | |3\*fn\_low – 1\*fx\_high| | | |3\*fn\_high – 1\*fx\_low| |
| IMD frequency limits (MHz) | 1778 – 1913 | | | 1581 – 1706 | | |
| Two-tone 4th order IMD products | |2\*fx\_low –2\* fn\_high| | | |2\*fx\_high –2\* fn\_low| | |2\*fx\_low +2\* fn\_low| | | |2\*fx\_high +2\* fn\_high| |
| IMD frequency limits (MHz) | 36 – 166 | | | 3424 – 3554 | | |
| Two-tone 4th order IMD products | |3\*fx\_low +1\* fn\_low| | | |3\*fx\_high + 1\*fn\_high| | |3\*fn\_low + 1\*fx\_low| | | |3\*fn\_high + 1\*fx\_high| |
| IMD frequency limits (MHz) | 3472 – 3607 | | | 3376 – 3501 | | |
| Two-tone 5th order IMD products | |fx\_low – 4\*fn\_high| | | |fx\_high – 4\*fn\_low| | |fn\_low – 4\*fx\_high| | | |fn\_high – 4\*fx\_low| |
| IMD frequency limits (MHz) | 2413 – 2568 | | | 2658 – 2828 | | |
| Two-tone 5th order IMD products | |2\*fx\_low - 3\*fn\_high| | | |2\*fx\_high - 3\*fn\_low| | |2\*fn\_low - 3\*fx\_high| | | |2\*fn\_high -3\*fx\_low| |
| IMD frequency limits (MHz) | 666 – 826 | | | 916 – 1081 | | |
| Two-tone 5th order IMD products | |fx\_low + 4\*fn\_low| | | |fx\_high + 4\*fn\_high| | |fn\_low + 4\*fx\_low| | | |fn\_high + 4\*fx\_high| |
| IMD frequency limits (MHz) | 4208 – 4363 | | | 4352 – 4522 | | |
| Two-tone 5th order IMD products | |2\*fx\_low + 3\*fn\_low| | | |2\*fx\_high + 3\*fn\_high| | |2\*fn\_low + 3\*fx\_low| | | |2\*fn\_high + 3\*fx\_high| |
| IMD frequency limits (MHz) | 4256 – 4416 | | | 4304 – 4469 | | |

Based on Table 5.33.2-3,

- 2nd order harmonics may fall into Rx frequencies of bands 7, 41 and 90.

- 3rd order harmonics may fall into Rx frequencies of bands 3, 38, 41, 69 and 90.

- 3rd order IMD may fall into Rx frequencies of bands 7, 8, 13, 14, 20, 28, 38, 38, 41, 44, 67, 68, 69 and 90.

- 4th order IMD may fall into Rx frequencies of bands 3, 9, 22, 33, 35, 37, 39, 42, 43, 48, 49, 52, 77 and 78.

- 5th order IMD may fall into Rx frequencies of bands 7, 8, 12, 13, 14, 17, 20, 28, 29, 41, 44, 53, 67, 68, 79, 85 and 90.

When a 2UL inter-band DC UE is operating with other systems such as Wi-Fi, Bluetooth and GNSS, the harmonics and intermodulation products can have an impact on these systems. Table 5.33.2-4 lists if up to 3rd order harmonics and IMD up to 5th order falls into one of these receiving bands.

**Table 5.33.2-4: 2UL Band 8 + Band n20 harmonic and IMD for ISM and GNSS bands**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Victim Systems** | **Frequency range [MHz]** | | | **Impact** | **Regions** | **Comments** |
| COMPASS  (Beidou) | 1559 | - | 1591 | Yes |  | IMD4 |
| Galileo | 1559 | - | 1591 | Yes |  | IMD4 |
| GLONASS | 1591 | - | 1610 | Yes |  | IMD4 |
| GPS | 1563 | - | 1587 | Yes |  | IMD4 |
| ISM band  (2.4GHz) | 2400 | - | 2483.5 | Yes | US/Europe | IMD5 |
| 2400 | - | 2494 | Yes | Asia | IMD5 |
| ISM band  (5GHz) | 5150 | - | 5925 | No | US |  |
| 5150 | - | 5350 | No | Europe |  |
| 5470 | - | 5725 | No |  |
| 5150 | - | 5825 | No | Asia |  |

The requirements for spurious emission band UE coexistence already exist in 38.101-3 for DC\_8\_n20.

5.33.3 ∆TIB and ∆RIB values

**Table 5.33.3-1: ΔTIB,c**

| Inter-band EN-DC configuration | ΔTIB,c for E-UTRA band / NR band (dB)6 | | |
| --- | --- | --- | --- |
| Component band in order of bands in configuration7 | | |
| DC\_7-8\_n20 | 0.3 | 0.6 | 0.6 |

**Table 5.33.3-2: ΔRIB**

| **Inter-band EN-DC configuration** | ΔRIB,c for E-UTRA band / NR band (dB)7 | | |
| --- | --- | --- | --- |
| Component band in order of bands in configuration8 | | |
| DC\_7-8\_n20 | 0 | 0.2 | 0.2 |

5.33.4 Reference sensitivity exceptions

**Table 5.33.4-1: 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-8A\_n20A | 7 | 2520 | 5 | 25 | 2640 | 21.1 | IMD34,15 |
| 8 | 900 | 5 | 25 | 945 | N/A | N/A |
| n20 | 840 | 5 | 25 | 799 | N/A | N/A |
| 7 | 2503 | 5 | 25 | 2623 | N/A | N/A |
| n20 | 859 | 5 | 25 | 818 | N/A | N/A |
| 8 | N/A | 5 | N/A | 933 | 4.4 | IMD5 |
| NOTE 4: This band is subject to IMD5 also which MSD is not specified.  NOTE 15: This band is subject to additional IMD3 for which MSD is not specified. | | | | | | | |

## 5.34 DC\_7-28\_n20

5.34.1 Configurations for DC

**Table 5.34.1-1: Inter-band DC configurations (three bands)**

| **EN-DC**  **configuration** | **Uplink EN-DC**  **configuration**  **(NOTE 1)** |
| --- | --- |
| DC\_7A-28A\_n20A | DC\_7A\_n20A  DC\_28A\_n20A |

5.34.2 Co-existence studies

Table 5.34.2-1 lists the Band 7A + Band n20A 2UL DC 2nd and 3rd order harmonics and 2nd, 3rd, 4th and 5th order IMD for the UE-to-UE coexistence analysis.

**Table 5.34.2-1: Band 7 and Band n20 UL harmonics and IMD products**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **UE UL carriers** | **fx\_low** | **fx\_high** | | **fn\_low** | **fn\_high** | |
| UL frequency (MHz) | 2500 | 2570 | | 832 | 862 | |
| 2nd harmonics frequency limits | 2\*fx\_low | 2\*fx\_high | | 2\* fn\_low | 2\* fn\_high | |
| 2nd harmonics frequency limits (MHz) | 5000 – 5140 | | | 1664 – 1724 | | |
| 3rd harmonics frequency limits | 3\*fx\_low | | 3\*fx\_high | 3\* fn\_low | | 3\* fn\_high |
| 3rd harmonics frequency limits (MHz) | 7500 – 7710 | | | 2496 – 2586 | | |
| 2nd order IMD products | |fn\_low – fx\_high| | |fn\_high – fx\_low| | | |fn\_low + fx\_low| | |fn\_high + fx\_high| | |
| IMD frequency limits (MHz) | 1638 – 1738 | | | 3332 – 3432 | | |
| Two-tone 3rd order IMD products | |2\*fx\_low – fn\_high| | |2\*fx\_high – fn\_low| | | |2\*fn\_low – fx\_high| | |2\*fn\_high – fx\_low| | |
| IMD frequency limits (MHz) | 4138 – 4308 | | | 776 – 906 | | |
| Two-tone 3rd order IMD products | |2\*fx\_low + fn\_low| | |2\*fx\_high + fn\_high| | | |2\*fn\_low + fx\_low| | |2\*fn\_high + fx\_high| | |
| IMD frequency limits (MHz) | 5832 – 6002 | | | 4164 – 4294 | | |
| Two-tone 3rd order IMD products | (fx\_low – max BW fn) | | (fx\_high + max BW fn) | (fn\_low – max BW fx) | | (fn\_high + max BW fx) |
| IMD frequency limits (MHz) | 2480 – 2590 | | | 812 – 882 | | |
| Two-tone 4th order IMD products | |3\*fx\_low –1\* fn\_high| | | |3\*fx\_high – 1\*fn\_low| | |3\*fn\_low – 1\*fx\_high| | | |3\*fn\_high – 1\*fx\_low| |
| IMD frequency limits (MHz) | 6638 – 6878 | | | 74 – 86 | | |
| Two-tone 4th order IMD products | |2\*fx\_low –2\* fn\_high| | | |2\*fx\_high –2\* fn\_low| | |2\*fx\_low +2\* fn\_low| | | |2\*fx\_high +2\* fn\_high| |
| IMD frequency limits (MHz) | 3276 – 3476 | | | 6664 – 6864 | | |
| Two-tone 4th order IMD products | |3\*fx\_low +1\* fn\_low| | | |3\*fx\_high + 1\*fn\_high| | |3\*fn\_low + 1\*fx\_low| | | |3\*fn\_high + 1\*fx\_high| |
| IMD frequency limits (MHz) | 8332 – 8572 | | | 4996 – 5156 | | |
| Two-tone 5th order IMD products | |fx\_low – 4\*fn\_high| | | |fx\_high – 4\*fn\_low| | |fn\_low – 4\*fx\_high| | | |fn\_high – 4\*fx\_low| |
| IMD frequency limits (MHz) | 758 – 948 | | | 9138 – 9448 | | |
| Two-tone 5th order IMD products | |2\*fx\_low - 3\*fn\_high| | | |2\*fx\_high - 3\*fn\_low| | |2\*fn\_low - 3\*fx\_high| | | |2\*fn\_high -3\*fx\_low| |
| IMD frequency limits (MHz) | 2414 – 2644 | | | 5776 – 6046 | | |
| Two-tone 5th order IMD products | |fx\_low + 4\*fn\_low| | | |fx\_high + 4\*fn\_high| | |fn\_low + 4\*fx\_low| | | |fn\_high + 4\*fx\_high| |
| IMD frequency limits (MHz) | 5828 – 6018 | | | 10832 – 11142 | | |
| Two-tone 5th order IMD products | |2\*fx\_low + 3\*fn\_low| | | |2\*fx\_high + 3\*fn\_high| | |2\*fn\_low + 3\*fx\_low| | | |2\*fn\_high + 3\*fx\_high| |
| IMD frequency limits (MHz) | 7496 – 7726 | | | 9164 – 9434 | | |

Based on Table 5.34.2-1,

- 3rd order harmonics may fall into Rx frequencies of bands 38, 41, 69 and 90.

- 2nd order IMD may fall into Rx frequencies of bands 42, 52, 77 and 78.

- 3rd order IMD may fall into Rx frequencies of bands 5, 6, 18, 19, 20, 26, 27, 28, 44, 46, 47, 68 and 77.

- 4th order IMD may fall into Rx frequencies of bands 42, 46, 52, 77, 78 and 79.

- 5th order IMD may fall into Rx frequencies of bands 5, 6, 7, 8, 14, 18, 19, 20, 26, 27, 28, 38, 41, 44, 46, 47, 53, 68, 69 and 90.

When a 2UL inter-band DC UE is operating with other systems such as Wi-Fi, Bluetooth and GNSS, the harmonics and intermodulation products can have an impact on these systems. Table 5.34.2-2 lists if up to 3rd order harmonics and IMD up to 5th order falls into one of these receiving bands.

**Table 5.34.2-2: 2UL Band 7 + Band n20 harmonic and IMD for ISM and GNSS bands**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Victim Systems** | **Frequency range [MHz]** | | | **Impact** | **Regions** | **Comments** |
| COMPASS  (Beidou) | 1559 | - | 1591 | No |  |  |
| Galileo | 1559 | - | 1591 | No |  |  |
| GLONASS | 1591 | - | 1610 | No |  |  |
| GPS | 1563 | - | 1587 | No |  |  |
| ISM band  (2.4GHz) | 2400 | - | 2483.5 | Yes | US/Europe | IMD5 |
| 2400 | - | 2494 | Yes | Asia | IMD5 |
| ISM band  (5GHz) | 5150 | - | 5925 | Yes | US | IMD3, IMD4, IMD5 |
| 5150 | - | 5350 | Yes | Europe | IMD4 |
| 5470 | - | 5725 | No |  |
| 5150 | - | 5825 | Yes | Asia | IMD4, IMD5 |

The requirements for spurious emission band UE coexistence already exist in 38.101-3 for DC\_7\_n20.

Table 5.34.2-3 lists the Band 28A + Band n20A 2UL DC 2nd and 3rd order harmonics and 2nd, 3rd, 4th and 5th order IMD for the UE-to-UE coexistence analysis.

**Table 5.34.2-3: Band 28 and Band n20 UL harmonics and IMD products**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **UE UL carriers** | **fx\_low** | **fx\_high** | | **fn\_low** | **fn\_high** | |
| UL frequency (MHz) | 703 | 748 | | 832 | 862 | |
| 2nd harmonics frequency limits | 2\*fx\_low | 2\*fx\_high | | 2\* fn\_low | 2\* fn\_high | |
| 2nd harmonics frequency limits (MHz) | 1406 – 1496 | | | 1664 – 1724 | | |
| 3rd harmonics frequency limits | 3\*fx\_low | | 3\*fx\_high | 3\* fn\_low | | 3\* fn\_high |
| 3rd harmonics frequency limits (MHz) | 2109 – 2244 | | | 2496 – 2586 | | |
| 2nd order IMD products | |fn\_low – fx\_high| | |fn\_high – fx\_low| | | |fn\_low + fx\_low| | |fn\_high + fx\_high| | |
| IMD frequency limits (MHz) | 84 – 159 | | | 1535 – 1610 | | |
| Two-tone 3rd order IMD products | |2\*fx\_low – fn\_high| | |2\*fx\_high – fn\_low| | | |2\*fn\_low – fx\_high| | |2\*fn\_high – fx\_low| | |
| IMD frequency limits (MHz) | 544 – 664 | | | 916 – 1021 | | |
| Two-tone 3rd order IMD products | |2\*fx\_low + fn\_low| | |2\*fx\_high + fn\_high| | | |2\*fn\_low + fx\_low| | |2\*fn\_high + fx\_high| | |
| IMD frequency limits (MHz) | 2238 – 2358 | | | 2367 – 2472 | | |
| Two-tone 3rd order IMD products | (fx\_low – max BW fn) | | (fx\_high + max BW fn) | (fn\_low – max BW fx) | | (fn\_high + max BW fx) |
| IMD frequency limits (MHz) | 683 – 768 | | | 812 – 882 | | |
| Two-tone 4th order IMD products | |3\*fx\_low –1\* fn\_high| | | |3\*fx\_high – 1\*fn\_low| | |3\*fn\_low – 1\*fx\_high| | | |3\*fn\_high – 1\*fx\_low| |
| IMD frequency limits (MHz) | 1247 – 1412 | | | 1748 – 1883 | | |
| Two-tone 4th order IMD products | |2\*fx\_low –2\* fn\_high| | | |2\*fx\_high –2\* fn\_low| | |2\*fx\_low +2\* fn\_low| | | |2\*fx\_high +2\* fn\_high| |
| IMD frequency limits (MHz) | 168 – 318 | | | 3070 – 3220 | | |
| Two-tone 4th order IMD products | |3\*fx\_low +1\* fn\_low| | | |3\*fx\_high + 1\*fn\_high| | |3\*fn\_low + 1\*fx\_low| | | |3\*fn\_high + 1\*fx\_high| |
| IMD frequency limits (MHz) | 2941 – 3106 | | | 3199 – 3334 | | |
| Two-tone 5th order IMD products | |fx\_low – 4\*fn\_high| | | |fx\_high – 4\*fn\_low| | |fn\_low – 4\*fx\_high| | | |fn\_high – 4\*fx\_low| |
| IMD frequency limits (MHz) | 2580 – 2745 | | | 1950 – 2160 | | |
| Two-tone 5th order IMD products | |2\*fx\_low - 3\*fn\_high| | | |2\*fx\_high - 3\*fn\_low| | |2\*fn\_low - 3\*fx\_high| | | |2\*fn\_high -3\*fx\_low| |
| IMD frequency limits (MHz) | 1000 – 1180 | | | 385 – 580 | | |
| Two-tone 5th order IMD products | |fx\_low + 4\*fn\_low| | | |fx\_high + 4\*fn\_high| | |fn\_low + 4\*fx\_low| | | |fn\_high + 4\*fx\_high| |
| IMD frequency limits (MHz) | 4031 – 4196 | | | 3644 – 3854 | | |
| Two-tone 5th order IMD products | |2\*fx\_low + 3\*fn\_low| | | |2\*fx\_high + 3\*fn\_high| | |2\*fn\_low + 3\*fx\_low| | | |2\*fn\_high + 3\*fx\_high| |
| IMD frequency limits (MHz) | 3902 – 4082 | | | 3773 – 3968 | | |

Based on Table 5.34.2-3,

- 2nd order harmonics may fall into Rx frequencies of bands 11, 21, 32, 38, 41, 45, 50, 51, 69, 74, 75, 76, 90, 91, 92, 93 and 94.

- 3rd order harmonics may fall into Rx frequencies of bands 1, 4, 10, 23, 65 and 66.

- 2nd order IMD may fall into Rx frequencies of band 24.

- 3rd order IMD may fall into Rx frequencies of bands 8, 30, 40 and 71.

- 4th order IMD may fall into Rx frequencies of bands 3, 9, 35, 39, 52, 77 and 78.

- 5th order IMD may fall into Rx frequencies of bands 1, 2, 4, 7, 10, 25, 31, 34, 36, 38, 41, 43, 48, 49, 65, 66, 69, 70, 72, 73, 77, 78, 87, 88 and 90.

When a 2UL inter-band DC UE is operating with other systems such as Wi-Fi, Bluetooth and GNSS, the harmonics and intermodulation products can have an impact on these systems. Table 5.34.2-4 lists if up to 3rd order harmonics and IMD up to 5th order falls into one of these receiving bands.

**Table 5.34.2-4: 2UL Band 28 + Band n20 harmonic and IMD for ISM and GNSS bands**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Victim Systems** | **Frequency range [MHz]** | | | **Impact** | **Regions** | **Comments** |
| COMPASS  (Beidou) | 1559 | - | 1591 | Yes |  | IMD2 |
| Galileo | 1559 | - | 1591 | Yes |  | IMD2 |
| GLONASS | 1591 | - | 1610 | Yes |  | IMD2 |
| GPS | 1563 | - | 1587 | Yes |  | IMD2 |
| ISM band  (2.4GHz) | 2400 | - | 2483.5 | Yes | US/Europe | IMD3 |
| 2400 | - | 2494 | Yes | Asia | IMD3 |
| ISM band  (5GHz) | 5150 | - | 5925 | No | US |  |
| 5150 | - | 5350 | No | Europe |  |
| 5470 | - | 5725 | No |  |
| 5150 | - | 5825 | No | Asia |  |

The requirements for spurious emission band UE coexistence that exist in 38.101-3 for DC\_20\_n28 can be reused.

5.34.3 ∆TIB and ∆RIB values

**Table 5.34.3-1: ΔTIB,c**

| Inter-band EN-DC configuration | ΔTIB,c for E-UTRA band / NR band (dB)6 | | |
| --- | --- | --- | --- |
| Component band in order of bands in configuration7 | | |
| DC\_7-28\_n20 | 0.3 | 0.6 | 0.6 |

**Table 5.34.3-2: ΔRIB**

| **Inter-band EN-DC configuration** | ΔRIB,c for E-UTRA band / NR band (dB)7 | | |
| --- | --- | --- | --- |
| Component band in order of bands in configuration8 | | |
| DC\_7-28\_n20 | 0 | 0.2 | 0.2 |

5.34.4 Reference sensitivity exceptions**Table 5.344-1: 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-28A\_n20A | 7 | 2520 | 5 | 25 | 2640 | 5.9 | IMD5 |
| 28 | 728 | 5 | 25 | 783 | N/A | N/A |
| n20 | 842 | 5 | 25 | 801 | N/A | N/A |
| 7 | 2505 | 5 | 25 | 2625 | N/A | N/A |
| n20 | 859 | 5 | 25 | 818 | N/A | N/A |
| 28 | N/A | 5 | N/A | 787 | 17.4 | IMD3 |

## 5.35 DC\_5-7\_n40

### 5.35.1 Configurations for DC

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

| **EN-DC**  **configuration** | **Uplink EN-DC**  **configuration** |
| --- | --- |
| DC\_5A-7A\_n40A | DC\_5A\_n40A  DC\_7A\_n40A |

### 5.35.2 Co-existence studies

For UE coexistence study of Band 5 + Band n40, the 2nd, 3rd, 4th, and 5th order harmonics and the 2nd, 3rd, 4th, and 5th order inter-modulation products are calculated and presented in Table 5.35.2-1.

Based on this calculation, we find that there is no impact of harmonics and inter-modulation products from UL DC\_5\_n40 affecting DL Band 7.

Table 5.35.2-1: Harmonics and IMD analysis of Band 5 + Band n40

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **UE UL carriers** | **fx\_low** | **fx\_high** | **fy\_low** | **fy\_high** |
| UL frequency (MHz) | 824 | 849 | 2300 | 2400 |
| 2nd harmonics frequency limits | 2\*fx\_low | 2\*fx\_high | 2\*fy\_low | 2\*fy\_high |
| 2nd harmonics frequency limits (MHz) | 1648 | 1698 | 4600 | 4800 |
| 3rd harmonics frequency limits | 3\*fx\_low | 3\*fx\_high | 3\*fy\_low | 3\*fy\_high |
| 3rd harmonics frequency limits (MHz) | 2472 | 2547 | 6900 | 7200 |
| 4th harmonics frequency limits | 4\*fx\_low | 4\*fx\_high | 4\*fy\_low | 4\*fy\_high |
| 4th harmonics frequency limits (MHz) | 3296 | 3396 | 9200 | 9600 |
| 5th harmonics frequency limits | 5\*fx\_low | 5\*fx\_high | 5\*fy\_low | 5\*fy\_high |
| 5th harmonics frequency limits (MHz) | 4120 | 4245 | 11500 | 12000 |
| Two-tone 2nd order IMD products | |fy\_low – fx\_high| | |fy\_high – fx\_low| | |fy\_low + fx\_low| | |fy\_high + fx\_high| |
| IMD frequency limits (MHz) | 1451 | 1576 | 3124 | 3249 |
| Two-tone 3rd order IMD products | |2\*fx\_low – fy\_high| | |2\*fx\_high – fy\_low| | |2\*fy\_low – fx\_high| | |2\*fy\_high – fx\_low| |
| IMD frequency limits (MHz) | 752 | 602 | 3751 | 3976 |
| Two-tone 3rd order IMD products | |2\*fx\_low + fy\_low| | |2\*fx\_high + fy\_high| | |2\*fy\_low + fx\_low| | |2\*fy\_high + fx\_high| |
| IMD frequency limits (MHz) | 3948 | 4098 | 5424 | 5649 |
| Two-tone 4th order IMD products | |3\*fx\_low – fy\_high| | |3\*fx\_high – fy\_low| | |3\*fy\_low – fx\_high| | |3\*fy\_high – fx\_low| |
| IMD frequency limits (MHz) | 72 | 247 | 6051 | 6376 |
| Two-tone 4th order IMD products | |2\*fx\_low – 2\*fy\_high| | |2\*fx\_high – 2\*fy\_low| | |2\*fx\_low + 2\*fy\_low| | |2\*fx\_high + 2\*fy\_high| |
| IMD frequency limits (MHz) | 3152 | 2902 | 6248 | 6498 |
| Two-tone 4th order IMD products | |3\*fx\_low + fy\_low| | |3\*fx\_high + fy\_high| | |3\*fy\_low + fx\_low| | |3\*fy\_high + fx\_high| |
| IMD frequency limits (MHz) | 4772 | 4947 | 7724 | 8049 |
| Two-tone 5th order IMD products | |fx\_low – 4\*fy\_high| | |fx\_high – 4\*fy\_low| | |fy\_low – 4\*fx\_high| | |fy\_high – 4\*fx\_low| |
| IMD frequency limits (MHz) | 8776 | 8351 | 1096 | 896 |
| Two-tone 5th order IMD products | |2\*fx\_low – 3\*fy\_high| | |2\*fx\_high – 3\*fy\_low| | |2\*fy\_low – 3\*fx\_high| | |2\*fy\_high – 3\*fx\_low| |
| IMD frequency limits (MHz) | 5552 | 5202 | 2053 | 2328 |
| Two-tone 5th order IMD products | |fx\_low + 4\*fy\_low| | |fx\_high + 4\*fy\_high| | |fy\_low + 4\*fx\_low| | |fy\_high + 4\*fx\_high| |
| IMD frequency limits (MHz) | 10024 | 10449 | 5596 | 5796 |
| Two-tone 5th order IMD products | |2\*fx\_low + 3\*fy\_low| | |2\*fx\_high + 3\*fy\_high| | |2\*fy\_low + 3\*fx\_low| | |2\*fy\_high + 3\*fx\_high| |
| IMD frequency limits (MHz) | 8548 | 8898 | 7072 | 7347 |

For UE coexistence study of Band 7 + Band n40, the 2nd, 3rd, 4th, and 5th order harmonics and the 2nd, 3rd, 4th, and 5th order inter-modulation products are calculated and presented in Table 5.35.2-2.

Based on this calculation, we find that there is no impact of harmonics and inter-modulation products from UL DC\_7\_n40 affecting DL Band 5.

Table 5.35.2-2: Harmonics and IMD analysis of Band 7 + Band n40

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **UE UL carriers** | **fx\_low** | **fx\_high** | **fy\_low** | **fy\_high** |
| UL frequency (MHz) | 2500 | 2570 | 2300 | 2400 |
| 2nd harmonics frequency limits | 2\*fx\_low | 2\*fx\_high | 2\*fy\_low | 2\*fy\_high |
| 2nd harmonics frequency limits (MHz) | 5000 | 5140 | 4600 | 4800 |
| 3rd harmonics frequency limits | 3\*fx\_low | 3\*fx\_high | 3\*fy\_low | 3\*fy\_high |
| 3rd harmonics frequency limits (MHz) | 7500 | 7710 | 6900 | 7200 |
| 4th harmonics frequency limits | 4\*fx\_low | 4\*fx\_high | 4\*fy\_low | 4\*fy\_high |
| 4th harmonics frequency limits (MHz) | 10000 | 10280 | 9200 | 9600 |
| 5th harmonics frequency limits | 5\*fx\_low | 5\*fx\_high | 5\*fy\_low | 5\*fy\_high |
| 5th harmonics frequency limits (MHz) | 12500 | 12850 | 11500 | 12000 |
| Two-tone 2nd order IMD products | |fy\_low – fx\_high| | |fy\_high – fx\_low| | |fy\_low + fx\_low| | |fy\_high + fx\_high| |
| IMD frequency limits (MHz) | 270 | 100 | 4800 | 4970 |
| Two-tone 3rd order IMD products | |2\*fx\_low – fy\_high| | |2\*fx\_high – fy\_low| | |2\*fy\_low – fx\_high| | |2\*fy\_high – fx\_low| |
| IMD frequency limits (MHz) | 2600 | 2840 | 2030 | 2300 |
| Two-tone 3rd order IMD products | |2\*fx\_low + fy\_low| | |2\*fx\_high + fy\_high| | |2\*fy\_low + fx\_low| | |2\*fy\_high + fx\_high| |
| IMD frequency limits (MHz) | 7300 | 7540 | 7100 | 7370 |
| Two-tone 4th order IMD products | |3\*fx\_low – fy\_high| | |3\*fx\_high – fy\_low| | |3\*fy\_low – fx\_high| | |3\*fy\_high – fx\_low| |
| IMD frequency limits (MHz) | 5100 | 5410 | 4330 | 4700 |
| Two-tone 4th order IMD products | |2\*fx\_low – 2\*fy\_high| | |2\*fx\_high – 2\*fy\_low| | |2\*fx\_low + 2\*fy\_low| | |2\*fx\_high + 2\*fy\_high| |
| IMD frequency limits (MHz) | 200 | 540 | 9600 | 9940 |
| Two-tone 4th order IMD products | |3\*fx\_low + fy\_low| | |3\*fx\_high + fy\_high| | |3\*fy\_low + fx\_low| | |3\*fy\_high + fx\_high| |
| IMD frequency limits (MHz) | 9800 | 10110 | 9400 | 9770 |
| Two-tone 5th order IMD products | |fx\_low – 4\*fy\_high| | |fx\_high – 4\*fy\_low| | |fy\_low – 4\*fx\_high| | |fy\_high – 4\*fx\_low| |
| IMD frequency limits (MHz) | 7100 | 6630 | 7980 | 7600 |
| Two-tone 5th order IMD products | |2\*fx\_low – 3\*fy\_high| | |2\*fx\_high – 3\*fy\_low| | |2\*fy\_low – 3\*fx\_high| | |2\*fy\_high – 3\*fx\_low| |
| IMD frequency limits (MHz) | 2200 | 1760 | 3110 | 2700 |
| Two-tone 5th order IMD products | |fx\_low + 4\*fy\_low| | |fx\_high + 4\*fy\_high| | |fy\_low + 4\*fx\_low| | |fy\_high + 4\*fx\_high| |
| IMD frequency limits (MHz) | 11700 | 12170 | 12300 | 12680 |
| Two-tone 5th order IMD products | |2\*fx\_low + 3\*fy\_low| | |2\*fx\_high + 3\*fy\_high| | |2\*fy\_low + 3\*fx\_low| | |2\*fy\_high + 3\*fx\_high| |
| IMD frequency limits (MHz) | 11900 | 12340 | 12100 | 12510 |

### 5.35.3 ∆TIB and ∆RIB values

For DC\_5-7\_n40, ΔTIB,c and ΔRIB,c values are given as follows.

Table 5.35.3-1: ΔTIB,c

| Inter-band EN-DC configuration | ΔTIB,c for E-UTRA band / NR band (dB)6 | | |
| --- | --- | --- | --- |
| Component band in order of bands in configuration7 | | |
| DC\_5-7\_n40 | 0.3 | 0.5 | 0.6 |
| NOTE 6: “-” denotes ΔTIB,c = 0.  NOTE 7: The component band order in the configuration should be listed by the order of E-UTRA band and NR band respectively, such as for DC\_66\_(n)12 the band order from left to right is 12, 66 and n12. | | | |

**Table 5.35.3-2: ΔRIB,c**

| **Inter-band EN-DC configuration** | ΔRIB,c for E-UTRA band / NR band (dB)7 | | |
| --- | --- | --- | --- |
| Component band in order of bands in configuration8 | | |
| DC\_5-7\_n40 | 0.2 | 0.3 | 0.7 |
| NOTE 7: “-” denotes ΔRIB,c = 0.  NOTE 8: The component band order in the configuration should be listed by the order of E-UTRA band and NR band respectively, such as for DC\_5\_(n)12 the band order from left to right is 5, 12 and n12. | | | |

### 5.35.4 Reference sensitivity exceptions

Based on the coexistence study results, there is no need to define additional MSD requirements for this band combination.

## 5.36 DC\_20-(n)3

5.36.1 Operating bands for EN-DC

Table 5.36.1-1: EN-DC Band combinations (three bands)

| EN-DC band | E-UTRA CA band | NR band | Single UL allowed |
| --- | --- | --- | --- |
| DC\_20-(n)3 | CA\_3-20 | n3 | DC\_(n)3 |

### 5.36.2 Configuration for DC

Table 5.36.2-1: Inter-band EN-DC configurations (three bands)

| EN-DC  Configuration | Uplink EN-DC  configuration  (NOTE 1) | E-UTRA CA configuration | NR band |
| --- | --- | --- | --- |
| DC\_20A-(n)3AA | DC\_(n)3AA2  DC\_20A\_n3A | CA\_3A-20A | n3A |
| NOTE 2: Only single switched UL is supported | | | |

5.36.3 ∆TIB and ∆RIB values

For DC\_20-(n)3, the ΔTIB,c and ΔRIB,c values are reused from DC\_20\_n3 and are given in the tables below.

**Table 5.36.3-1:ΔTIB,c due to EN-DC (three bands)**

| Inter-band EN-DC configuration | ΔTIB,c for E-UTRA band / NR band (dB)6 | | |
| --- | --- | --- | --- |
| Component band in order of bands in configuration7 | | |
| DC\_20-(n)3 | 0.3 | 0.3 | 0.3 |
| NOTE 6: “-” denotes ΔTIB,c = 0.  NOTE 7: The component band order in the configuration should be listed by the order of E-UTRA band and NR band respectively, such as for DC\_66\_(n)12 the band order from left to right is 12, 66 and n12. | | | |

**Table 5.36.3-2:ΔRIB,c due to EN-DC (three bands)**

| **Inter-band EN-DC configuration** | ΔRIB,c for E-UTRA band / NR band (dB)7 | | |
| --- | --- | --- | --- |
| Component band in order of bands in configuration8 | | |
| DC\_20-(n)3 | - | - | - |
| NOTE 7: “-” denotes ΔRIB,c = 0.  NOTE 8: The component band order in the configuration should be listed by the order of E-UTRA band and NR band respectively, such as for DC\_5\_(n)12 the band order from left to right is 5, 12 and n12. | | | |

5.36.4 REFSENS requirements

There are IMD4 impact from UL 20\_n3 affecting DL band 3.

MSD value band n3 is derived from DC\_3\_n20.

A similar approach to the effect on SCell as DC\_3\_(n)7 (see R4-2216086) has been used for MSD value band 3.

| 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\_20A-(n)3AA | 3 | N/A | 5 | N/A | 1865 | 3 | IMD4 |
|  | n3 | 1775 | 5 | 25 | 1870 | 4 | IMD4 |
|  | 20 | 840 | 5 | 25 | 799 | N/A | N/A |

## 5.37 DC\_3-8\_n7

### 5.37.1 Configurations for DC

Table 5.37.1-1: Inter-band DC configurations (three bands)

| DC  Configuration | Uplink configuration |
| --- | --- |
| DC\_3A-8A\_n7A | DC\_3A\_n7A  DC\_8A\_n7A |

### 5.37.2 Co-existence studies

For UE coexistence study of Band 3 + Band n7, the 2nd, 3rd and 4th order harmonics and 2nd, 3rd, 4th and 5th order intermodulation products were calculated and presented in Table 5.37.2-1.

**Table 5.37.2-1: Harmonic and IMD analysis**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **UE UL carriers** | **fx\_low** | **fx\_high** | **fy\_low** | **fy\_high** |
| UL frequency (MHz) | 1710 | 1785 | 2500 | 2570 |
| 2nd harmonics frequency limits | 2\*fx\_low | 2\*fx\_high | 2\* fy\_low | 2\* fy\_high |
| 2nd harmonics frequency limits (MHz) | 3420 | 3570 | 5000 | 5140 |
| 3rd harmonics frequency limits | 3\*fx\_low | 3\*fx\_high | 3\* fy\_low | 3\* fy\_high |
| 3rd harmonics frequency limits (MHz) | 5130 | 5355 | 7500 | 7710 |
| 4th harmonics frequency limits | 4\*fx\_low | 4\*fx\_high | 4\* fy\_low | 4\* fy\_high |
| 4th harmonics frequency limits (MHz) | 6840 | 7140 | 10000 | 10280 |
| 2nd order IMD products | |fy\_low – fx\_high| | |fy\_high – fx\_low| | |fy\_low + fx\_low| | |fy\_high + fx\_high| |
| IMD frequency limits (MHz) | 715 | 860 | 4210 | 4355 |
| Two-tone 3rd order IMD products | |2\*fx\_low – fy\_high| | |2\*fx\_high – fy\_low| | |2\*fy\_low – fx\_high| | |2\*fy\_high – fx\_low| |
| IMD frequency limits (MHz) | 850 | 1070 | 3215 | 3430 |
| Two-tone 3rd order IMD products | |2\*fx\_low + fy\_low| | |2\*fx\_high + fy\_high| | |2\*fy\_low + fx\_low| | |2\*fy\_high + fx\_high| |
| IMD frequency limits (MHz) | 5920 | 6140 | 6710 | 6925 |
| Two-tone 4th order IMD products | |3\*fx\_low - fy\_high| | |3\*fx\_high - fy\_low| | |3\*fy\_low - fx\_high| | |3\*fy\_high - fx\_low| |
| IMD frequency limits (MHz) | 2560 | 2855 | 5715 | 6000 |
| Two-tone 4th order IMD products | |3\*fx\_low + fy\_low| | |3\*fx\_high + fy\_high| | |3\*fy\_low + fx\_low| | |3\*fy\_high + fx\_high| |
| IMD frequency limits (MHz) | 7630 | 7925 | 9210 | 9495 |
| Two-tone 4th order IMD products | |2\*fx\_high –2\* fy\_low| | |2\*fx\_low - 2\* fy\_high| | |2\*fx\_low +2\* fy\_low| | |2\*fx\_high +2\* fy\_high| |
| IMD frequency limits (MHz) | 1430 | 1570 | 8420 | 8710 |
| Two-tone 5th order IMD products | |fx\_high – 4\*fy\_low| | |fx\_low – 4\*fy\_high| | |fy\_high – 4\*fx\_low| | |fy\_low – 4\*fx\_high| |
| IMD frequency limits (MHz) | 8215 | 8570 | 4270 | 4640 |
| Two-tone 5th order IMD products | |2\*fx\_high - 3\*fy\_low| | |2\*fx\_low - 3\*fy\_high| | |2\*fy\_high -3\*fx\_low| | |2\*fy\_low - 3\*fx\_high| |
| IMD frequency limits (MHz) | 3930 | 4290 | 10 | 355 |
| Two-tone 5th order IMD products | |fx\_low + 4\*fy\_low| | |fx\_high + 4\*fy\_high| | |fy\_low + 4\*fx\_low| | |fy\_high + 4\*fx\_high| |
| IMD frequency limits (MHz) | 11710 | 12065 | 9340 | 9710 |
| Two-tone 5th order IMD products | |2\*fx\_low + 3\*fy\_low| | |2\*fx\_high + 3\*fy\_high| | |2\*fy\_low + 3\*fx\_low| | |2\*fy\_high + 3\*fx\_high| |
| IMD frequency limits (MHz) | 10920 | 11280 | 10130 | 10495 |

As we can see from the above table, there could be MSD due to IMD:

- The 3rd order IMD generated by Band 3 and Band n7 may fall into DL reception frequency of Band 8.

- The 4th order IMD generated by Band 3 and Band n7 may fall into DL reception frequency of Band n7.The MSD value for the 3rd order IMD can reuse what have been specified in TS 36.101 Table 7.3.1A-0g for CA\_3A-7A-8A. For the 4th order IMD, it has already been studied with its fallback mode.

For UE coexistence study of Band 8 + Band n7, the 2nd, 3rd and 4th order harmonics and 2nd, 3rd, 4th and 5th order intermodulation products were calculated and presented in Table 5.37.2-2.

**Table 5.37.2-2: Harmonic and IMD analysis**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **UE UL carriers** | **fx\_low** | **fx\_high** | **fy\_low** | **fy\_high** |
| UL frequency (MHz) | 880 | 915 | 2500 | 2570 |
| 2nd harmonics frequency limits | 2\*fx\_low | 2\*fx\_high | 2\* fy\_low | 2\* fy\_high |
| 2nd harmonics frequency limits (MHz) | 1760 | 1830 | 5000 | 5140 |
| 3rd harmonics frequency limits | 3\*fx\_low | 3\*fx\_high | 3\* fy\_low | 3\* fy\_high |
| 3rd harmonics frequency limits (MHz) | 2640 | 2745 | 7500 | 7710 |
| 4th harmonics frequency limits | 4\*fx\_low | 4\*fx\_high | 4\* fy\_low | 4\* fy\_high |
| 4th harmonics frequency limits (MHz) | 3520 | 3660 | 10000 | 10280 |
| 2nd order IMD products | |fy\_low – fx\_high| | |fy\_high – fx\_low| | |fy\_low + fx\_low| | |fy\_high + fx\_high| |
| IMD frequency limits (MHz) | 1585 | 1690 | 3380 | 3485 |
| Two-tone 3rd order IMD products | |2\*fx\_high – fy\_low| | |2\*fx\_low – fy\_high| | |2\*fy\_low – fx\_high| | |2\*fy\_high – fx\_low| |
| IMD frequency limits (MHz) | 670 | 810 | 4085 | 4260 |
| Two-tone 3rd order IMD products | |2\*fx\_low + fy\_low| | |2\*fx\_high + fy\_high| | |2\*fy\_low + fx\_low| | |2\*fy\_high + fx\_high| |
| IMD frequency limits (MHz) | 4260 | 4400 | 5880 | 6055 |
| Two-tone 4th order IMD products | |3\*fx\_low - fy\_high| | |3\*fx\_high - fy\_low| | |3\*fy\_low - fx\_high| | |3\*fy\_high - fx\_low| |
| IMD frequency limits (MHz) | 70 | 245 | 6585 | 6830 |
| Two-tone 4th order IMD products | |3\*fx\_low + fy\_low| | |3\*fx\_high + fy\_high| | |3\*fy\_low + fx\_low| | |3\*fy\_high + fx\_high| |
| IMD frequency limits (MHz) | 5140 | 5315 | 8380 | 8625 |
| Two-tone 4th order IMD products | |2\*fx\_high –2\* fy\_low| | |2\*fx\_low - 2\* fy\_high| | |2\*fx\_low +2\* fy\_low| | |2\*fx\_high +2\* fy\_high| |
| IMD frequency limits (MHz) | 3170 | 3310 | 6760 | 6970 |
| Two-tone 5th order IMD products | |fx\_high – 4\*fy\_low| | |fx\_low – 4\*fy\_high| | |fy\_high – 4\*fx\_low| | |fy\_low – 4\*fx\_high| |
| IMD frequency limits (MHz) | 9085 | 9400 | 950 | 1160 |
| Two-tone 5th order IMD products | |2\*fx\_high - 3\*fy\_low| | |2\*fx\_low - 3\*fy\_high| | |2\*fy\_low - 3\*fx\_high| | |2\*fy\_high -3\*fx\_low| |
| IMD frequency limits (MHz) | 5670 | 5950 | 2255 | 2500 |
| Two-tone 5th order IMD products | |fx\_low + 4\*fy\_low| | |fx\_high + 4\*fy\_high| | |fy\_low + 4\*fx\_low| | |fy\_high + 4\*fx\_high| |
| IMD frequency limits (MHz) | 10880 | 11195 | 6020 | 6230 |
| Two-tone 5th order IMD products | |2\*fx\_low + 3\*fy\_low| | |2\*fx\_high + 3\*fy\_high| | |2\*fy\_low + 3\*fx\_low| | |2\*fy\_high + 3\*fx\_high| |
| IMD frequency limits (MHz) | 9260 | 9540 | 7640 | 7885 |

As we can see from the above table, there could be MSD due to IMD:

- The 5th order IMD generated by Band 8 and Band n7 may fall into DL reception frequency of Band 8.

Besides, harmonic could be a cause for MSD:

- The 2nd order harmonic generated by Band 8 may fall into DL reception frequency of Band 3.

- The 3rd order harmonic generated by Band 8 may fall into DL reception frequency of Band n7.

The above IMD issue has been studied for DC\_7-8\_n7. Specifically, when we consider the implementation of Band 8 duplexer, we can find that such 5th order IMD will not impact the DL reception of Band 8.

The MSD values due to the above two harmonic issues have been specified as in TS 38.101-3 table 7.3B.2.3.1-1.

### 5.37.3 ∆TIB and ∆RIB values

For DC\_3-8\_n7, the ΔTIB,c and ΔRIB,c values are given in the following tables. (Both are reusing the specified values for DC\_3-7\_n8 as in TS 38.101-3)

Table 5.37.3-1: ΔTIB,c

| Inter-band EN-DC configuration | ΔTIB,c for E-UTRA band / NR band (dB)6 | | |
| --- | --- | --- | --- |
| Component band in order of bands in configuration7 | | |
| DC\_3-8\_n7 | 0.5 | 0.6 | 0.5 |

**Table 5.37.3-2: ΔRIB**

| **Inter-band EN-DC configuration** | ΔRIB,c for E-UTRA band / NR band (dB)7 | | |
| --- | --- | --- | --- |
| Component band in order of bands in configuration8 | | |
| DC\_3-8\_n7 | 0 | 0.2 | 0 |

### 5.37.4 Reference sensitivity exceptions

The required MSD values are derived from CA\_3A-7A-8A.

Table 5.37.4-1: Reference sensitivity exceptions for Scell due to dual uplink operation for EN-DC in NR FR1 (three bands)

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| E-UTRA and NR 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\_n7A | 3 | 1735 | 5 | 25 | 1830 | N/A | N/A |
| n7 | 2530 | 10 | 50 | 2650 | N/A | N/A |
| 8 | 895 | 5 | 25 | 940 | 18.0 | IMD3 |

## 5.38 DC\_3-67\_n3

### 5.38.1 Configuration for DC

Table 5.38.2-1: Inter-band EN-DC configurations (three bands)

| EN-DC  Configuration | Uplink EN-DC  configuration  (NOTE 1) | E-UTRA CA configuration | NR band |
| --- | --- | --- | --- |
| DC\_3A-67A\_n3A | DC\_3A\_n3A2 | CA\_3A-67A | n3 |
| NOTE 2: Only single switched UL is supported | | | |

### 5.38.2 Co-existence studies

There are no IMD impact from UL 3\_n3 affecting DL band 67.

5.38.3 ∆TIB and ∆RIB values

For DC\_3-67\_n3, the ΔTIB,c and ΔRIB,c values are reused from CA\_n3-n67 and are given in the tables below.

**Table 5.1.3-1:ΔTIB,c due to EN-DC (three bands)**

| Inter-band EN-DC configuration | ΔTIB,c for E-UTRA band / NR band (dB)6 | | |
| --- | --- | --- | --- |
| Component band in order of bands in configuration7 | | |
| DC\_3-67\_n3 | - | - | - |
| NOTE 6: “-” denotes ΔTIB,c = 0.  NOTE 7: The component band order in the configuration should be listed by the order of E-UTRA band and NR band respectively, such as for DC\_66\_(n)12 the band order from left to right is 12, 66 and n12. | | | |

**Table 5.1.3-2:ΔRIB,c due to EN-DC (three bands)**

| **Inter-band EN-DC configuration** | ΔRIB,c for E-UTRA band / NR band (dB)7 | | |
| --- | --- | --- | --- |
| Component band in order of bands in configuration8 | | |
| DC\_3-67\_n3 | 0.3 | - | 0.3 |
| NOTE 7: “-” denotes ΔRIB,c = 0.  NOTE 8: The component band order in the configuration should be listed by the order of E-UTRA band and NR band respectively, such as for DC\_5\_(n)12 the band order from left to right is 5, 12 and n12. | | | |

5.38.4 REFSENS requirements

Based on the co-existence studies there are no need to define MSD values.

## 5.39 DC\_67-(n)3

### 5.39.1 Configuration for DC

Table 5.39.2-1: Inter-band EN-DC configurations (three bands)

| EN-DC  Configuration | Uplink EN-DC  configuration  (NOTE 1) | E-UTRA CA configuration | NR band |
| --- | --- | --- | --- |
| DC\_67A-(n)3AA | DC\_(n)3AA2 | CA\_3A-67A | n3 |
| NOTE 2: Only single switched UL is supported | | | |

### 5.39.2 Co-existence studies

There are no IMD impact.

5.39.3 ∆TIB and ∆RIB values

For DC\_67-(n)3, the ΔTIB,c and ΔRIB,c values are reused from CA\_n3-n67 and are given in the tables below.

**Table 5.1.3-1:ΔTIB,c due to EN-DC (three bands)**

| Inter-band EN-DC configuration | ΔTIB,c for E-UTRA band / NR band (dB)6 | | |
| --- | --- | --- | --- |
| Component band in order of bands in configuration7 | | |
| DC\_67-(n)3 | - | - | - |
| NOTE 6: “-” denotes ΔTIB,c = 0.  NOTE 7: The component band order in the configuration should be listed by the order of E-UTRA band and NR band respectively, such as for DC\_66\_(n)12 the band order from left to right is 12, 66 and n12. | | | |

**Table 5.1.3-2:ΔRIB,c due to EN-DC (three bands)**

| **Inter-band EN-DC configuration** | ΔRIB,c for E-UTRA band / NR band (dB)7 | | |
| --- | --- | --- | --- |
| Component band in order of bands in configuration8 | | |
| DC\_67-(n)3 | 0.3 | - | 0.3 |
| NOTE 7: “-” denotes ΔRIB,c = 0.  NOTE 8: The component band order in the configuration should be listed by the order of E-UTRA band and NR band respectively, such as for DC\_5\_(n)12 the band order from left to right is 5, 12 and n12. | | | |

5.39.4 REFSENS requirements

Based on the co-existence studies there are no need to define MSD values.

## 5.40 DC\_20-67\_n3

### 5.40.1 Configuration for DC

Table 5.40.2-1: Inter-band EN-DC configurations (three bands)

| EN-DC  Configuration | Uplink EN-DC  configuration  (NOTE 1) | E-UTRA CA configuration | NR band |
| --- | --- | --- | --- |
| DC\_20A-67A\_n3A | DC\_20A\_n3A | CA\_20A-67A | n3 |

### 5.40.2 Co-existence studies

There are IMD4 impact from UL 20\_n3 affecting DL band 67.

5.40.3 ∆TIB and ∆RIB values

For DC\_20-67\_n3, the ΔTIB,c and ΔRIB,c values are reused from DC\_20\_n3-n67 and are given in the tables below.

**Table 5.1.3-1:ΔTIB,c due to EN-DC (three bands)**

| Inter-band EN-DC configuration | ΔTIB,c for E-UTRA band / NR band (dB)6 | | |
| --- | --- | --- | --- |
| Component band in order of bands in configuration7 | | |
| DC\_20-67\_n3 | 0.5 | - | 0.3 |
| NOTE 6: “-” denotes ΔTIB,c = 0.  NOTE 7: The component band order in the configuration should be listed by the order of E-UTRA band and NR band respectively, such as for DC\_66\_(n)12 the band order from left to right is 12, 66 and n12. | | | |

**Table 5.1.3-2:ΔRIB,c due to EN-DC (three bands)**

| **Inter-band EN-DC configuration** | ΔRIB,c for E-UTRA band / NR band (dB)7 | | |
| --- | --- | --- | --- |
| Component band in order of bands in configuration8 | | |
| DC\_20-67\_n3 | 0.1 | 0.1 | - |
| NOTE 7: “-” denotes ΔRIB,c = 0.  NOTE 8: The component band order in the configuration should be listed by the order of E-UTRA band and NR band respectively, such as for DC\_5\_(n)12 the band order from left to right is 5, 12 and n12. | | | |

5.40.4 REFSENS requirements

Based on the co-existence studies there is a need to define MSD value.

The MSD value for band n67 is reused from DC\_20\_n3-n67.

| EN-DC Configuration | EUTRA / NR band | UL Fc  (MHz) | UL/DL BW  (MHz) | UL  LCRB | DL Fc (MHz) | MSD  (dB) | IMD order |
| --- | --- | --- | --- | --- | --- | --- | --- |
| DC\_20-67\_n3 | 20 | 837 | 5 | 25 | 796 | N/A | N/A |
|  | 67 | N/A | 5 | 25 | 746 | 9.4 | IMD4 |
|  | n3 | 1765 | 5 | 25 | 1860 | N/A | N/A |

## 5.41 DC\_3-8\_n41

5.41.1 Configuration for DC

**Table 5.41.2-1: Inter-band DC configurations (three bands)**

| **EN-DC**  **configuration** | **Uplink EN-DC**  **configuration**  **(NOTE 1)** |
| --- | --- |
| DC\_3A-8A\_n41A | DC\_3A\_n41A DC\_8A\_n41A |

5.41.2 Co-existence studies

The harmonic and IMD products caused by UL DC\_8\_n41 are shown below.

**Table 5.41.3-1: The harmonic and IMD products caused by UL DC\_8\_n41**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **DL frequency** | **fx\_low** | **fx\_high** | **fy\_low** | **fy\_high** |
| **880** | **915** | **2496** | **2690** |
| 2nd order IMD products | |fy\_low-fx\_high| | |fy\_high-fx\_low| | |fy\_low+fx\_low| | |fy\_high+fx\_high| |
| IMD frequency limits (MHz) | 1581 | 1810 | 3376 | 3605 |
| Two-tone 3rd order IMD products | |fy\_high – 2\*fx\_low| | |fy\_low – 2\*fx\_high| | |2\*fy\_low – fx\_high| | |2\*fy\_high – fx\_low| |
| IMD frequency limits (MHz) | 930 | 666 | 4077 | 4500 |
| Two-tone 3rd order IMD products | |2\*fx\_low + fy\_low| | |2\*fx\_high + fy\_high| | |2\*fy\_low + fx\_low| | |2\*fy\_high + fx\_high| |
| IMD frequency limits (MHz) | 4256 | 4520 | 5872 | 6295 |
| Two-tone 4th order IMD products | |2\*fx\_low –2\* fy\_high| | |2\*fx\_high – 2\*fy\_low| | |2\*fx\_low +2\* fy\_low| | |2\*fx\_high +2\* fy\_high| |
| IMD frequency limits (MHz) | 3620 | 3162 | 6752 | 7210 |
| Two-tone 4th order IMD products | |3\*fx\_low –1\* fy\_high| | |3\*fx\_high – 1\*fy\_low| | |3\*fy\_low – 1\*fx\_high| | |3\*fy\_high – 1\*fx\_low| |
| IMD frequency limits (MHz) | 50 | 249 | 6573 | 7190 |
| Two-tone 4th order IMD products | |3\*fx\_low +1\* fy\_low| | |3\*fx\_high +1\* fy\_high| | |3\*fy\_low + 1\*fx\_low| | |3\*fy\_high + 1\*fx\_high| |
| IMD frequency limits (MHz) | 5136 | 5435 | 8368 | 8950 |
| Two-tone 5th order IMD products | |fx\_low – 4\*fy\_high| | |fx\_high – 4\*fy\_low| | |fy\_low – 4\*fx\_high| | |fy\_high – 4\*fx\_low| |
| IMD frequency limits (MHz) | 9880 | 9069 | 1164 | 830 |
| Two-tone 5th order IMD products | |fx\_low + 4\*fy\_low| | |fx\_high + 4\*fy\_high| | |fy\_low + 4\*fx\_low| | |fy\_high + 4\*fx\_high| |
| IMD frequency limits (MHz) | 10864 | 11675 | 6016 | 6350 |
| Two-tone 5th order IMD products | |2\*fx\_low – 3\*fy\_high| | |2\*fx\_high – 3\*fy\_low| | |2\*fy\_low – 3\*fx\_high| | |2\*fy\_high – 3\*fx\_low| |
| IMD frequency limits (MHz) | 6310 | 5658 | 2247 | 2740 |
| Two-tone 5th order IMD products | |2\*fx\_low + 3\*fy\_low| | |2\*fx\_high + 3\*fy\_high| | |2\*fy\_low + 3\*fx\_low| | |2\*fy\_high + 3\*fx\_high| |
| IMD frequency limits (MHz) | 9248 | 9900 | 7632 | 8125 |

The harmonic and IMD products caused by UL DC\_3\_n41 are shown below.

**Table 5.41.3-2: The harmonic and IMD products caused by UL DC\_3\_n41**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **UE UL carriers** | **fx\_low** | **fx\_high** | **fy\_low** | **fy\_high** |
| **UL frequency** | **1710** | **1785** | **2496** | **2690** |
| 2nd order IMD products | |fy\_low-fx\_high| | |fy\_high-fx\_low| | |fy\_low+fx\_low| | |fy\_high+fx\_high| |
| IMD frequency limits (MHz) | 711 | 980 | 4206 | 4475 |
| Two-tone 3rd order IMD products | |fy\_high – 2\*fx\_low| | |fy\_low – 2\*fx\_high| | |2\*fy\_low – fx\_high| | |2\*fy\_high – fx\_low| |
| IMD frequency limits (MHz) | 730 | 1074 | 3207 | 3670 |
| Two-tone 3rd order IMD products | |2\*fx\_low + fy\_low| | |2\*fx\_high + fy\_high| | |2\*fy\_low + fx\_low| | |2\*fy\_high + fx\_high| |
| IMD frequency limits (MHz) | 5916 | 6260 | 6702 | 7165 |
| Two-tone 4th order IMD products | |2\*fx\_low –2\* fy\_high| | |2\*fx\_high – 2\*fy\_low| |  |  |
| IMD frequency limits (MHz) | 1960 | 1422 |  |  |
| Two-tone 4th order IMD products | |3\*fx\_low –1\* fy\_high| | |3\*fx\_high – 1\*fy\_low| | |3\*fy\_low – 1\*fx\_high| | |3\*fy\_high – 1\*fx\_low| |
| IMD frequency limits (MHz) | 2440 | 2859 | 5703 | 6360 |
| Two-tone 4th order IMD products | |2\*fx\_low +2\* fy\_low| | |2\*fx\_high +2\* fy\_high| |  |  |
| IMD frequency limits (MHz) | 8412 | 8950 |  |  |
| Two-tone 4th order IMD products | |3\*fx\_low +1\* fy\_low| | |3\*fx\_high +1\* fy\_high| | |3\*fy\_low + 1\*fx\_low| | |3\*fy\_high + 1\*fx\_high| |
| IMD frequency limits (MHz) | 7626 | 8045 | 9198 | 9855 |
| Two-tone 5th order IMD products | |fx\_low – 4\*fy\_high| | |fx\_high – 4\*fy\_low| | |fy\_low – 4\*fx\_high| | |fy\_high – 4\*fx\_low| |
| IMD frequency limits (MHz) | 9050 | 8199 | 4644 | 4150 |
| Two-tone 5th order IMD products | |fx\_low + 4\*fy\_low| | |fx\_high + 4\*fy\_high| | |fy\_low + 4\*fx\_low| | |fy\_high + 4\*fx\_high| |
| IMD frequency limits (MHz) | 11694 | 12545 | 9336 | 9830 |
| Two-tone 5th order IMD products | |2\*fx\_low – 3\*fy\_high| | |2\*fx\_high – 3\*fy\_low| | |2\*fy\_low – 3\*fx\_high| | |2\*fy\_high – 3\*fx\_low| |
| IMD frequency limits (MHz) | 4650 | 3918 | 363 | 250 |
| Two-tone 5th order IMD products | |2\*fx\_low + 3\*fy\_low| | |2\*fx\_high + 3\*fy\_high| | |2\*fy\_low + 3\*fx\_low| | |2\*fy\_high + 3\*fx\_high| |
| IMD frequency limits (MHz) | 10908 | 11640 | 10122 | 10735 |

In light of the above co-existence table, we can observe:

Near miss IMD2 products caused by 8+n41 may fall into the its own band n3 Rx

IMD 2 and IMD3 caused by 3+n41 may fall into the its own band n8 Rx

5.41.4 ∆TIB and ∆RIB values

Referring to DC\_3A\_n8A-n41A, ΔTIB,c and ΔRIB,c for DC\_3A-n8A\_n41A can be specified as below.

**Table 5.41.4-1: ΔTIB,c due to EN-DC(three bands)**

| **Inter-band EN-DC configuration** | **ΔTIB,c for E-UTRA band / NR band (dB)6** | | |
| --- | --- | --- | --- |
| **Component band in order of bands in configuration7** | | |
| DC\_3-8\_n41 | 0.5 | 0.3 | 0.33/0.84 |
| NOTE 3: The requirement is applied for UE transmitting on the frequency range of 2515 – 2690 MHz.  NOTE 4: The requirement is applied for UE transmitting on the frequency range of 2496 – 2515 MHz.  NOTE 6: “-” denotes ΔTIB,c = 0.  NOTE 7: The component band order in the configuration should be listed by the order of E-UTRA band and NR band respectively, such as for DC\_66\_(n)12 the band order from left to right is 12, 66 and n12. | | | |

**Table 5.41.4-2: ΔRIB,c due to EN-DC (three bands)**

| **Inter-band EN-DC configuration** | **ΔRIB,c for E-UTRA band / NR band (dB)7** | | |
| --- | --- | --- | --- |
| **Component band in order of bands in configuration8** | | |
| DC\_3-8\_n41 | - | - | 03/0.54 |
| NOTE 3: The requirement is applied for UE transmitting on the frequency range of 2515 - 2690 MHz.  NOTE 4: The requirement is applied for UE transmitting on the frequency range of 2496 – 2515 MHz.  NOTE 7: “-” denotes ΔRIB,c = 0.  NOTE 8: The component band order in the configuration should be listed by the order of E-UTRA band and NR band respectively, such as for DC\_5\_(n)12 the band order from left to right is 5, 12 and n12. | | | |

5.41.5 MSD requirements

For UL DC\_8A\_n41A, the IMD2 due to dual UL of band n41 10MHz CBW and B8 5MHz  CBW may partially overlap the lowest 5MHz DL channel of band 3 leading to a special MSD test point, where the IMD center does not fall into the center of the DL victim in the MSD test configuration.

The estimation of IMD2 interference power level ration between direct hit and adjacent hit for DC\_3-8\_n41 based on measurement of the IMD2 PSD. The IMD2 interference is approximately 0.9dB lower when integrated at 1807.5MHz/5MHz CBW relative to the direct hit interference level measured at 1802.5MHz/5MHz. This is due to the IMD2 PSD flatness.



Referring to DC\_3A\_n8A-n41A, the MSD requirement are defined in table 5.41.5-1:

Table 5.41.5-1: 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 | | | | | | | Source of IMD |
| ENDC band combination | EUTRA / NR band | UL Fc  (MHz) | UL/DL BW  (MHz) | UL  CLRB | DL Fc (MHz) | MSD  (dB) |  |
| DC\_3A-8A\_n41A | 3 | 1725 | 5 | 25 | 1820 | N/A | N/A |
|  | 8 | 900 | 5 | 25 | 945 | 26.0 | IMD215 |
|  | n41 | 2670 | 10 | 50 | 2670 | N/A | N/A |
|  | 3 | 1712.5 | 5 | 25 | 1807.5 | 25 | IMD2x |
|  | 8 | 882.5 | 5 | 25 | 927.5 | N/A | N/A |
|  | n41 | 2685 | 10 | 50 | 2685 | N/A | N/A |
| NOTE 15: This band is subject to IMD3 also which MSD is not specified.  NOTE x: In the MSD test configuration, the IMD center does not fall into the DL victim Fc. | | | | | | | |

## 5.42 DC\_2-4\_n78

### 5.42.1 Operating bands for EN-DC

Table 5.42.1-1: EN-DC Band combinations (three bands)

| EN-DC band | E-UTRA CA band | NR band |
| --- | --- | --- |
| DC\_2-4\_n78 | CA\_2-4 | n78 |

### 5.42.2 Configuration for DC

Table 5.42.2-1: Inter-band EN-DC configurations (three bands)

| EN-DC  Configuration | Uplink EN-DC  configuration  (NOTE 1) | E-UTRA CA configuration | NR band |
| --- | --- | --- | --- |
| DC\_2A-4A\_n78A | DC\_2A\_n78A  DC\_4A\_n78A | CA\_2A-4A | n78A |

5.42.3 Co-existence studies

This is a 3-band combination, so uplink harmonic and harmonic mixing analysis is already done in the fallbacks. Only IMD for two uplink configurations is analysed.

A study of the uplink combination affecting the downlink of the third band is shown in Table 5.42.3-1 for DC\_2A\_n78A into band 4 downlink.

Table 5.42.3-1: IMD analysis for DC\_2A\_n78A

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **UE UL carriers** | **fx\_low** | **fx\_high** | **fy\_low** | **fy\_high** |
| UL Frequency [MHz] | 1850 | 1910 | 3300 | 3800 |
| DL Frequency [MHz] | 1930 | 1990 | 3300 | 3800 |
| 2nd order IMD products | |fy\_low – fx\_high| | |fy\_high – fx\_low| | |fy\_low + fx\_low| | |fy\_high + fx\_high| |
| IMD frequency limits (MHz) | 1390 | 1950 | 5150 | 5710 |
| 3rd order IMD products | |2\*fx\_low – fy\_high| | |2\*fx\_high – fy\_low| | |2\*fy\_low – fx\_high| | |2\*fy\_high – fx\_low| |
| IMD frequency limits (MHz) | 100 | 520 | 4690 | 5750 |
| 3rd order IMD products | |2\*fx\_low + fy\_low| | |2\*fx\_high + fy\_high| | |2\*fy\_low + fx\_low| | |2\*fy\_high + fx\_high| |
| IMD frequency limits (MHz) | 7000 | 7620 | 8450 | 9510 |
| Two-tone 4th order IMD products | |3\*fx\_low –1\* fy\_high| | |3\*fx\_high – 1\*fy\_low| | |3\*fy\_low – 1\*fx\_high| | |3\*fy\_high – 1\*fx\_low| |
| IMD frequency limits (MHz) | 1750 | 2430 | 7990 | 9550 |
| Two-tone 4th order IMD products | |2\*fx\_low –2\* fy\_high| | |2\*fx\_high –2\* fy\_low| | |2\*fx\_low +2\* fy\_low| | |2\*fx\_high +2\* fy\_high| |
| IMD frequency limits (MHz) | 3900 | 2780 | 10300 | 11420 |
| Two-tone 4th order IMD products | |3\*fx\_low +1\* fy\_low| | |3\*fx\_high + 1\*fy\_high| | |3\*fy\_low + 1\*fx\_low| | |3\*fy\_high + 1\*fx\_high| |
| IMD frequency limits (MHz) | 8850 | 9530 | 11750 | 13310 |
| Two-tone 5th order IMD products | |fx\_low – 4\*fy\_high| | |fx\_high – 4\*fy\_low| | |fy\_low – 4\*fx\_high| | |fy\_high – 4\*fx\_low| |
| IMD frequency limits (MHz) | 13350 | 11290 | 4340 | 3600 |
| Two-tone 5th order IMD products | |2\*fx\_low - 3\*fy\_high| | |2\*fx\_high - 3\*fy\_low| | |2\*fy\_low - 3\*fx\_high| | |2\*fy\_high -3\*fx\_low| |
| IMD frequency limits (MHz) | 7700 | 6080 | 870 | 2050 |
| Two-tone 5th order IMD products | |fx\_low + 4\*fy\_low| | |fx\_high + 4\*fy\_high| | |fy\_low + 4\*fx\_low| | |fy\_high + 4\*fx\_high| |
| IMD frequency limits (MHz) | 15050 | 17110 | 10700 | 11440 |
| Two-tone 5th order IMD products | |2\*fx\_low + 3\*fy\_low| | |2\*fx\_high + 3\*fy\_high| | |2\*fy\_low + 3\*fx\_low| | |2\*fy\_high + 3\*fx\_high| |
| IMD frequency limits (MHz) | 13600 | 15220 | 12150 | 13330 |

The analysis shows the 4th order IMD product falls inside band 4 downlink

A study of the uplink combination affecting the downlink of the third band is shown in Table 5.42.3-2 for DC\_4A\_n78A into band 2 downlink.

Table 5.42.3-2: IMD analysis for DC\_4A\_n78A

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **UE UL carriers** | **fx\_low** | **fx\_high** | **fy\_low** | **fy\_high** |
| UL Frequency [MHz] | 1710 | 1755 | 3300 | 3800 |
| DL Frequency [MHz] | 2110 | 2155 | 3300 | 3800 |
| 2nd order IMD products | |fy\_low – fx\_high| | |fy\_high – fx\_low| | |fy\_low + fx\_low| | |fy\_high + fx\_high| |
| IMD frequency limits (MHz) | 1545 | 2090 | 5010 | 5555 |
| 3rd order IMD products | |2\*fx\_low – fy\_high| | |2\*fx\_high – fy\_low| | |2\*fy\_low – fx\_high| | |2\*fy\_high – fx\_low| |
| IMD frequency limits (MHz) | 380 | 210 | 4845 | 5890 |
| 3rd order IMD products | |2\*fx\_low + fy\_low| | |2\*fx\_high + fy\_high| | |2\*fy\_low + fx\_low| | |2\*fy\_high + fx\_high| |
| IMD frequency limits (MHz) | 6720 | 7310 | 8310 | 9355 |
| Two-tone 4th order IMD products | |3\*fx\_low –1\* fy\_high| | |3\*fx\_high – 1\*fy\_low| | |3\*fy\_low – 1\*fx\_high| | |3\*fy\_high – 1\*fx\_low| |
| IMD frequency limits (MHz) | 1330 | 1965 | 8145 | 9690 |
| Two-tone 4th order IMD products | |2\*fx\_low –2\* fy\_high| | |2\*fx\_high –2\* fy\_low| | |2\*fx\_low +2\* fy\_low| | |2\*fx\_high +2\* fy\_high| |
| IMD frequency limits (MHz) | 4180 | 3090 | 10020 | 11110 |
| Two-tone 4th order IMD products | |3\*fx\_low +1\* fy\_low| | |3\*fx\_high + 1\*fy\_high| | |3\*fy\_low + 1\*fx\_low| | |3\*fy\_high + 1\*fx\_high| |
| IMD frequency limits (MHz) | 8430 | 9065 | 11610 | 13155 |
| Two-tone 5th order IMD products | |fx\_low – 4\*fy\_high| | |fx\_high – 4\*fy\_low| | |fy\_low – 4\*fx\_high| | |fy\_high – 4\*fx\_low| |
| IMD frequency limits (MHz) | 13490 | 11445 | 3720 | 3040 |
| Two-tone 5th order IMD products | |2\*fx\_low - 3\*fy\_high| | |2\*fx\_high - 3\*fy\_low| | |2\*fy\_low - 3\*fx\_high| | |2\*fy\_high -3\*fx\_low| |
| IMD frequency limits (MHz) | 7980 | 6390 | 1335 | 2470 |
| Two-tone 5th order IMD products | |fx\_low + 4\*fy\_low| | |fx\_high + 4\*fy\_high| | |fy\_low + 4\*fx\_low| | |fy\_high + 4\*fx\_high| |
| IMD frequency limits (MHz) | 14910 | 16955 | 10140 | 10820 |
| Two-tone 5th order IMD products | |2\*fx\_low + 3\*fy\_low| | |2\*fx\_high + 3\*fy\_high| | |2\*fy\_low + 3\*fx\_low| | |2\*fy\_high + 3\*fx\_high| |
| IMD frequency limits (MHz) | 13320 | 14910 | 11730 | 12865 |

The analysis shows the 2nd, 4th and 5th order IMD product falls inside band 2 downlink.

Based on Table 5.42.3-1 and Table 5.42.3-2:

* The 4th order IMD product of DC\_2\_n78 falls inside band 4 downlink
* The 2nd, 4th and 5th order IMD product of DC\_4\_n78 falls inside band 2 downlink

5.42.4 ∆TIB and ∆RIB values

For DC\_2-4\_n78, the ΔTIB,c and ΔRIB,c values are reused from DC\_2-66\_n78 and are given in the tables below.

**Table 5.42.4-1:ΔTIB,c due to EN-DC (three bands)**

| Inter-band EN-DC configuration | ΔTIB,c for E-UTRA band / NR band (dB)6 | | |
| --- | --- | --- | --- |
| Component band in order of bands in configuration7 | | |
| DC\_2-4\_n78 | 0.6 | 0.6 | 0.8 |
| NOTE 6: “-” denotes ΔTIB,c = 0.  NOTE 7: The component band order in the configuration should be listed by the order of E-UTRA band and NR band respectively, such as for DC\_66\_(n)12 the band order from left to right is 12, 66 and n12. | | | |

**Table 5.42.4-2:ΔRIB,c due to EN-DC (three bands)**

| **Inter-band EN-DC configuration** | ΔRIB,c for E-UTRA band / NR band (dB)7 | | |
| --- | --- | --- | --- |
| Component band in order of bands in configuration8 | | |
| DC\_2-4\_n78 | 0.3 | 0.3 | 0.5 |
| NOTE 7: “-” denotes ΔRIB,c = 0.  NOTE 8: The component band order in the configuration should be listed by the order of E-UTRA band and NR band respectively, such as for DC\_5\_(n)12 the band order from left to right is 5, 12 and n12. | | | |

5.42.5 REFSENS requirements

MSD values are reused from DC\_2A-66A\_n78A, but band 4 frequencies requires new test points.

Table 5.42.5-1: 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-4A\_n78A | 2 | 1875 | 5 | 25 | 1955 | N/A | N/A |
|  | 4 | 1745 | 5 | 25 | 2145 | 10.3 | IMD4 |
|  | n78 | 3480 | 10 | 50 | 3480 | N/A | N/A |
|  | 2 | 1880 | 5 | 25 | 1960 | 32.1 | IMD2 |
|  | 4 | 1740 | 5 | 25 | 2140 | N/A | N/A |
|  | n78 | 3700 | 10 | 50 | 3700 | N/A | N/A |
|  | 2 | 1860 | 5 | 25 | 1940 | 9.1 | IMD4 |
|  | 4 | 1750 | 5 | 25 | 2150 | N/A | N/A |
|  | n78 | 3310 | 10 | 50 | 3310 | N/A | N/A |
|  | 2 | 1870 | 5 | 25 | 1950 | 2.1 | IMD5 |
|  | 4 | 1750 | 5 | 25 | 2150 | N/A | N/A |
|  | n78 | 3600 | 10 | 50 | 3600 | N/A | N/A |

## 5.43 DC\_28-38\_n78

### 5.43.1 Operating bands for EN-DC

Table 5.43.1-1: EN-DC Band combinations (three bands)

| EN-DC band | E-UTRA CA band | NR band | Single UL allowed |
| --- | --- | --- | --- |
| DC\_28-38\_n78 | CA\_28-38 | n78 | No |

### 5.43.2 Configuration for DC

Table 5.43.2-1: Inter-band EN-DC configurations (three bands)

| EN-DC  Configuration | Uplink EN-DC  configuration  (NOTE 1) | E-UTRA CA configuration | NR band |
| --- | --- | --- | --- |
| DC\_28A-38A\_n78A | DC\_28A\_n78A  DC\_38A\_n78A | CA\_28A-38A | n78A |

5.43.3 Co-existence studies

This is a 3-band combination, so uplink harmonic and harmonic mixing analysis is already done in the fallbacks. Only IMD for two uplink configurations is analysed.

A study of the uplink combination affecting the downlink of the third band is shown in Table 5.43.3-1 for DC\_28A\_n78A into band 38 downlink.

Table 5.43.3-1: IMD analysis for DC\_28A\_n78A

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **UE UL carriers** | **fx\_low** | **fx\_high** | **fy\_low** | **fy\_high** |
| UL Frequency [MHz] | 703 | 748 | 3300 | 3800 |
| DL Frequency [MHz] | 758 | 803 | 3300 | 3800 |
| 2nd order IMD products | |fy\_low – fx\_high| | |fy\_high – fx\_low| | |fy\_low + fx\_low| | |fy\_high + fx\_high| |
| IMD frequency limits (MHz) | 2552 | 3097 | 4003 | 4548 |
| 3rd order IMD products | |2\*fx\_low – fy\_high| | |2\*fx\_high – fy\_low| | |2\*fy\_low – fx\_high| | |2\*fy\_high – fx\_low| |
| IMD frequency limits (MHz) | 2394 | 1804 | 5852 | 6897 |
| 3rd order IMD products | |2\*fx\_low + fy\_low| | |2\*fx\_high + fy\_high| | |2\*fy\_low + fx\_low| | |2\*fy\_high + fx\_high| |
| IMD frequency limits (MHz) | 4706 | 5296 | 7303 | 8348 |
| Two-tone 4th order IMD products | |3\*fx\_low –1\* fy\_high| | |3\*fx\_high – 1\*fy\_low| | |3\*fy\_low – 1\*fx\_high| | |3\*fy\_high – 1\*fx\_low| |
| IMD frequency limits (MHz) | 1691 | 1056 | 9152 | 10697 |
| Two-tone 4th order IMD products | |2\*fx\_low –2\* fy\_high| | |2\*fx\_high –2\* fy\_low| | |2\*fx\_low +2\* fy\_low| | |2\*fx\_high +2\* fy\_high| |
| IMD frequency limits (MHz) | 6194 | 5104 | 8006 | 9096 |
| Two-tone 4th order IMD products | |3\*fx\_low +1\* fy\_low| | |3\*fx\_high + 1\*fy\_high| | |3\*fy\_low + 1\*fx\_low| | |3\*fy\_high + 1\*fx\_high| |
| IMD frequency limits (MHz) | 5409 | 6044 | 10603 | 12148 |
| Two-tone 5th order IMD products | |fx\_low – 4\*fy\_high| | |fx\_high – 4\*fy\_low| | |fy\_low – 4\*fx\_high| | |fy\_high – 4\*fx\_low| |
| IMD frequency limits (MHz) | 14497 | 12452 | 308 | 988 |
| Two-tone 5th order IMD products | |2\*fx\_low - 3\*fy\_high| | |2\*fx\_high - 3\*fy\_low| | |2\*fy\_low - 3\*fx\_high| | |2\*fy\_high -3\*fx\_low| |
| IMD frequency limits (MHz) | 9994 | 8404 | 4356 | 5491 |
| Two-tone 5th order IMD products | |fx\_low + 4\*fy\_low| | |fx\_high + 4\*fy\_high| | |fy\_low + 4\*fx\_low| | |fy\_high + 4\*fx\_high| |
| IMD frequency limits (MHz) | 13903 | 15948 | 6112 | 6792 |
| Two-tone 5th order IMD products | |2\*fx\_low + 3\*fy\_low| | |2\*fx\_high + 3\*fy\_high| | |2\*fy\_low + 3\*fx\_low| | |2\*fy\_high + 3\*fx\_high| |
| IMD frequency limits (MHz) | 11306 | 12896 | 8709 | 9844 |

The analysis shows the 2nd order IMD product falls inside band 38 downlink.

A study of the uplink combination affecting the downlink of the third band is shown in Table 5.43.3-2 for DC\_38A\_n78A into band 28 downlink.

Table 5.43.3-2: IMD analysis for DC\_7A\_n78A

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **UE UL carriers** | **fx\_low** | **fx\_high** | **fy\_low** | **fy\_high** |
| UL Frequency [MHz] | 2570 | 2620 | 3300 | 3800 |
| DL Frequency [MHz] | 2570 | 2620 | 3300 | 3800 |
| 2nd order IMD products | |fy\_low – fx\_high| | |fy\_high – fx\_low| | |fy\_low + fx\_low| | |fy\_high + fx\_high| |
| IMD frequency limits (MHz) | 680 | 1230 | 5870 | 6420 |
| 3rd order IMD products | |2\*fx\_low – fy\_high| | |2\*fx\_high – fy\_low| | |2\*fy\_low – fx\_high| | |2\*fy\_high – fx\_low| |
| IMD frequency limits (MHz) | 1340 | 1940 | 3980 | 5030 |
| 3rd order IMD products | |2\*fx\_low + fy\_low| | |2\*fx\_high + fy\_high| | |2\*fy\_low + fx\_low| | |2\*fy\_high + fx\_high| |
| IMD frequency limits (MHz) | 8440 | 9040 | 9170 | 10220 |
| Two-tone 4th order IMD products | |3\*fx\_low –1\* fy\_high| | |3\*fx\_high – 1\*fy\_low| | |3\*fy\_low – 1\*fx\_high| | |3\*fy\_high – 1\*fx\_low| |
| IMD frequency limits (MHz) | 3910 | 4560 | 7280 | 8830 |
| Two-tone 4th order IMD products | |2\*fx\_low –2\* fy\_high| | |2\*fx\_high –2\* fy\_low| | |2\*fx\_low +2\* fy\_low| | |2\*fx\_high +2\* fy\_high| |
| IMD frequency limits (MHz) | 2460 | 1360 | 11740 | 12840 |
| Two-tone 4th order IMD products | |3\*fx\_low +1\* fy\_low| | |3\*fx\_high + 1\*fy\_high| | |3\*fy\_low + 1\*fx\_low| | |3\*fy\_high + 1\*fx\_high| |
| IMD frequency limits (MHz) | 11010 | 11660 | 12470 | 14020 |
| Two-tone 5th order IMD products | |fx\_low – 4\*fy\_high| | |fx\_high – 4\*fy\_low| | |fy\_low – 4\*fx\_high| | |fy\_high – 4\*fx\_low| |
| IMD frequency limits (MHz) | 12630 | 10580 | 7180 | 6480 |
| Two-tone 5th order IMD products | |2\*fx\_low - 3\*fy\_high| | |2\*fx\_high - 3\*fy\_low| | |2\*fy\_low - 3\*fx\_high| | |2\*fy\_high -3\*fx\_low| |
| IMD frequency limits (MHz) | 6260 | 4660 | 1260 | 110 |
| Two-tone 5th order IMD products | |fx\_low + 4\*fy\_low| | |fx\_high + 4\*fy\_high| | |fy\_low + 4\*fx\_low| | |fy\_high + 4\*fx\_high| |
| IMD frequency limits (MHz) | 15770 | 17820 | 13580 | 14280 |
| Two-tone 5th order IMD products | |2\*fx\_low + 3\*fy\_low| | |2\*fx\_high + 3\*fy\_high| | |2\*fy\_low + 3\*fx\_low| | |2\*fy\_high + 3\*fx\_high| |
| IMD frequency limits (MHz) | 15040 | 16640 | 14310 | 15460 |

The analysis shows the 2nd and 5th order IMD product falls inside band 28 downlink.

Based on Table 5.43.3-1 and Table 5.43.3-2:

* The 2nd order IMD product of DC\_28\_n78 falls inside band 38 downlink
* The 2nd and 5th order IMD product of DC\_38\_n78 falls inside band 28 downlink

5.43.4 ∆TIB and ∆RIB values

For DC\_28-38\_n78, the ΔTIB,c and ΔRIB,c values are reused from DC\_28-41\_n78 and are given in the tables below.

**Table 5.43.4-1:ΔTIB,c due to EN-DC (three bands)**

| Inter-band EN-DC configuration | ΔTIB,c for E-UTRA band / NR band (dB)6 | | |
| --- | --- | --- | --- |
| Component band in order of bands in configuration7 | | |
| DC\_28-38\_n78 | 0.5 | 0.3 | 0.8 |
| NOTE 6: “-” denotes ΔTIB,c = 0.  NOTE 7: The component band order in the configuration should be listed by the order of E-UTRA band and NR band respectively, such as for DC\_66\_(n)12 the band order from left to right is 12, 66 and n12. | | | |

**Table 5.43.4-2:ΔRIB,c due to EN-DC (three bands)**

| **Inter-band EN-DC configuration** | ΔRIB,c for E-UTRA band / NR band (dB)7 | | |
| --- | --- | --- | --- |
| Component band in order of bands in configuration8 | | |
| DC\_28-38\_n78 | 0.2 | 0.4 | 0.5 |
| NOTE 7: “-” denotes ΔRIB,c = 0.  NOTE 8: The component band order in the configuration should be listed by the order of E-UTRA band and NR band respectively, such as for DC\_5\_(n)12 the band order from left to right is 5, 12 and n12. | | | |

5.43.5 REFSENS requirements

MSD values are reused from DC\_28A-41A\_n78A. The test frequencies are not re-used.

Table 5.43.5-1: 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\_28A-38A\_n78A | 28 | 738 | 5 | 25 | 793 | N/A | N/A |
|  | 38 | 2582 | 5 | 25 | 2582 | 29.5 | IMD2 |
|  | n78 | 3320 | 10 | 50 | 3320 | N/A | N/A |
|  | 28 | 738 | 5 | 25 | 793 | 30.8 | IMD24 |
|  | 38 | 2582 | 5 | 25 | 2582 | N/A | N/A |
|  | n78 | 3375 | 10 | 50 | 3375 | N/A | N/A |

## 5.44 DC\_4-7\_n78

### 5.44.1 Operating bands for EN-DC

Table 5.44.1-1: EN-DC Band combinations (three bands)

| EN-DC band | E-UTRA CA band | NR band | Single UL allowed |
| --- | --- | --- | --- |
| DC\_4-7\_n78 | CA\_4-7 | n78 | No |

### 5.44.2 Configuration for DC

Table 5.44.2-1: Inter-band EN-DC configurations (three bands)

| EN-DC  Configuration | Uplink EN-DC  configuration  (NOTE 1) | E-UTRA CA configuration | NR band |
| --- | --- | --- | --- |
| DC\_4A-7A\_n78A | DC\_4A\_n78A  DC\_7A\_n78A | CA\_4A-7A | n78A |
| DC\_4A-7C\_n78A | DC\_4A\_n78A  DC\_7C\_n78A | CA\_4A-7C | n78A |

5.44.3 Co-existence studies

This is a 3-band combination, so uplink harmonic and harmonic mixing analysis is already done in the fallbacks. Only IMD for two uplink configurations is analysed.

A study of the uplink combination affecting the downlink of the third band is shown in Table 5.44.3-1 for DC\_4A\_n78A into band 7 downlink.

Table 5.44.3-1: IMD analysis for DC\_4A\_n78A

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **UE UL carriers** | **fx\_low** | **fx\_high** | **fy\_low** | **fy\_high** |
| UL Frequency [MHz] | 1710 | 1755 | 3300 | 3800 |
| DL Frequency [MHz] | 2110 | 2155 | 3300 | 3800 |
| 2nd order IMD products | |fy\_low – fx\_high| | |fy\_high – fx\_low| | |fy\_low + fx\_low| | |fy\_high + fx\_high| |
| IMD frequency limits (MHz) | 1545 | 2090 | 5010 | 5555 |
| 3rd order IMD products | |2\*fx\_low – fy\_high| | |2\*fx\_high – fy\_low| | |2\*fy\_low – fx\_high| | |2\*fy\_high – fx\_low| |
| IMD frequency limits (MHz) | 380 | 210 | 4845 | 5890 |
| 3rd order IMD products | |2\*fx\_low + fy\_low| | |2\*fx\_high + fy\_high| | |2\*fy\_low + fx\_low| | |2\*fy\_high + fx\_high| |
| IMD frequency limits (MHz) | 6720 | 7310 | 8310 | 9355 |
| Two-tone 4th order IMD products | |3\*fx\_low –1\* fy\_high| | |3\*fx\_high – 1\*fy\_low| | |3\*fy\_low – 1\*fx\_high| | |3\*fy\_high – 1\*fx\_low| |
| IMD frequency limits (MHz) | 1330 | 1965 | 8145 | 9690 |
| Two-tone 4th order IMD products | |2\*fx\_low –2\* fy\_high| | |2\*fx\_high –2\* fy\_low| | |2\*fx\_low +2\* fy\_low| | |2\*fx\_high +2\* fy\_high| |
| IMD frequency limits (MHz) | 4180 | 3090 | 10020 | 11110 |
| Two-tone 4th order IMD products | |3\*fx\_low +1\* fy\_low| | |3\*fx\_high + 1\*fy\_high| | |3\*fy\_low + 1\*fx\_low| | |3\*fy\_high + 1\*fx\_high| |
| IMD frequency limits (MHz) | 8430 | 9065 | 11610 | 13155 |
| Two-tone 5th order IMD products | |fx\_low – 4\*fy\_high| | |fx\_high – 4\*fy\_low| | |fy\_low – 4\*fx\_high| | |fy\_high – 4\*fx\_low| |
| IMD frequency limits (MHz) | 13490 | 11445 | 3720 | 3040 |
| Two-tone 5th order IMD products | |2\*fx\_low - 3\*fy\_high| | |2\*fx\_high - 3\*fy\_low| | |2\*fy\_low - 3\*fx\_high| | |2\*fy\_high -3\*fx\_low| |
| IMD frequency limits (MHz) | 7980 | 6390 | 1335 | 2470 |
| Two-tone 5th order IMD products | |fx\_low + 4\*fy\_low| | |fx\_high + 4\*fy\_high| | |fy\_low + 4\*fx\_low| | |fy\_high + 4\*fx\_high| |
| IMD frequency limits (MHz) | 14910 | 16955 | 10140 | 10820 |
| Two-tone 5th order IMD products | |2\*fx\_low + 3\*fy\_low| | |2\*fx\_high + 3\*fy\_high| | |2\*fy\_low + 3\*fx\_low| | |2\*fy\_high + 3\*fx\_high| |
| IMD frequency limits (MHz) | 13320 | 14910 | 11730 | 12865 |

The analysis shows there is no IMD issues of this uplink combination.

A study of the uplink combination affecting the downlink of the third band is shown in Table 5.44.3-2 for DC\_7A\_n78A into band 4 downlink.

Table 5.44.3-2: IMD analysis for DC\_7A\_n78A

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **UE UL carriers** | **fx\_low** | **fx\_high** | **fy\_low** | **fy\_high** |
| UL Frequency [MHz] | 2500 | 2570 | 3300 | 3800 |
| DL Frequency [MHz] | 2620 | 2690 | 3300 | 3800 |
| 2nd order IMD products | |fy\_low – fx\_high| | |fy\_high – fx\_low| | |fy\_low + fx\_low| | |fy\_high + fx\_high| |
| IMD frequency limits (MHz) | 730 | 1300 | 5800 | 6370 |
| 3rd order IMD products | |2\*fx\_low – fy\_high| | |2\*fx\_high – fy\_low| | |2\*fy\_low – fx\_high| | |2\*fy\_high – fx\_low| |
| IMD frequency limits (MHz) | 1200 | 1840 | 4030 | 5100 |
| 3rd order IMD products | |2\*fx\_low + fy\_low| | |2\*fx\_high + fy\_high| | |2\*fy\_low + fx\_low| | |2\*fy\_high + fx\_high| |
| IMD frequency limits (MHz) | 8300 | 8940 | 9100 | 10170 |
| Two-tone 4th order IMD products | |3\*fx\_low –1\* fy\_high| | |3\*fx\_high – 1\*fy\_low| | |3\*fy\_low – 1\*fx\_high| | |3\*fy\_high – 1\*fx\_low| |
| IMD frequency limits (MHz) | 3700 | 4410 | 7330 | 8900 |
| Two-tone 4th order IMD products | |2\*fx\_low –2\* fy\_high| | |2\*fx\_high –2\* fy\_low| | |2\*fx\_low +2\* fy\_low| | |2\*fx\_high +2\* fy\_high| |
| IMD frequency limits (MHz) | 2600 | 1460 | 11600 | 12740 |
| Two-tone 4th order IMD products | |3\*fx\_low +1\* fy\_low| | |3\*fx\_high + 1\*fy\_high| | |3\*fy\_low + 1\*fx\_low| | |3\*fy\_high + 1\*fx\_high| |
| IMD frequency limits (MHz) | 10800 | 11510 | 12400 | 13970 |
| Two-tone 5th order IMD products | |fx\_low – 4\*fy\_high| | |fx\_high – 4\*fy\_low| | |fy\_low – 4\*fx\_high| | |fy\_high – 4\*fx\_low| |
| IMD frequency limits (MHz) | 12700 | 10630 | 6980 | 6200 |
| Two-tone 5th order IMD products | |2\*fx\_low - 3\*fy\_high| | |2\*fx\_high - 3\*fy\_low| | |2\*fy\_low - 3\*fx\_high| | |2\*fy\_high -3\*fx\_low| |
| IMD frequency limits (MHz) | 6400 | 4760 | 1110 | 100 |
| Two-tone 5th order IMD products | |fx\_low + 4\*fy\_low| | |fx\_high + 4\*fy\_high| | |fy\_low + 4\*fx\_low| | |fy\_high + 4\*fx\_high| |
| IMD frequency limits (MHz) | 15700 | 17770 | 13300 | 14080 |
| Two-tone 5th order IMD products | |2\*fx\_low + 3\*fy\_low| | |2\*fx\_high + 3\*fy\_high| | |2\*fy\_low + 3\*fx\_low| | |2\*fy\_high + 3\*fx\_high| |
| IMD frequency limits (MHz) | 14900 | 16540 | 14100 | 15310 |

The analysis shows the 4th order IMD product falls inside band 4 downlink.

Based on Table 5.44.3-1 and Table 5.44.3-2:

* The 4th order IMD product of DC\_7\_n78 falls inside band 4 downlink

5.44.4 ∆TIB and ∆RIB values

For DC\_4-7\_n78, the ΔTIB,c and ΔRIB,c values are reused from DC\_7-66\_n78 and are given in the tables below.

**Table 5.44.4-1:ΔTIB,c due to EN-DC (three bands)**

| Inter-band EN-DC configuration | ΔTIB,c for E-UTRA band / NR band (dB)6 | | |
| --- | --- | --- | --- |
| Component band in order of bands in configuration7 | | |
| DC\_4-7\_n78 | 0.6 | 0.5 | 0.8 |
| NOTE 6: “-” denotes ΔTIB,c = 0.  NOTE 7: The component band order in the configuration should be listed by the order of E-UTRA band and NR band respectively, such as for DC\_66\_(n)12 the band order from left to right is 12, 66 and n12. | | | |

**Table 5.44.4-2:ΔRIB,c due to EN-DC (three bands)**

| **Inter-band EN-DC configuration** | ΔRIB,c for E-UTRA band / NR band (dB)7 | | |
| --- | --- | --- | --- |
| Component band in order of bands in configuration8 | | |
| DC\_4-7\_n78 | 0.5 | 0.5 | 0.5 |
| NOTE 7: “-” denotes ΔRIB,c = 0.  NOTE 8: The component band order in the configuration should be listed by the order of E-UTRA band and NR band respectively, such as for DC\_5\_(n)12 the band order from left to right is 5, 12 and n12. | | | |

5.44.5 REFSENS requirements

MSD values are reused from DC\_7A-66A\_n78A. The test frequencies are not re-used.

Table 5.44.5-1: 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\_4A-7A\_n78A | 4 | 1750 | 5 | 25 | 2150 | 8.7 | IMD4 |
|  | 7 | 2550 | 5 | 25 | 2670 | N/A | N/A |
|  | n78 | 3625 | 10 | 50 | 3625 | N/A | N/A |

## 5.45 DC\_66-71\_n25

5.45.1 Configuration for DC

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

| **EN-DC**  **Configuration** | **Uplink EN-DC**  **configuration** |
| --- | --- |
| DC\_66A-71A\_n25A | DC\_66A\_n25A  DC\_71A\_n25A |

5.45.2 Co-existence studies

There is no IMD impact from UL 71\_n25 affecting DL band 66.

There is no IMD impact from UL 66\_n25 affecting DL band 71.

5.45.3 ∆TIB and ∆RIB values

For DC\_66-71\_n25, the ΔTIB,c and ΔRIB,c values are reused from CA\_n25-n66-n71 and are given in the tables below.

**Table 5.45.3-1:ΔTIB,c due to EN-DC (three bands)**

| **Inter-band EN-DC configuration** | **ΔTIB,c for E-UTRA band / NR band (dB)6** | | |
| --- | --- | --- | --- |
| **Component band in order of bands in configuration7** | | |
| DC\_66-71\_n25 | 0.5 | 0.6 | 0.5 |
| NOTE 6: “-” denotes ΔTIB,c = 0.  NOTE 7: The component band order in the configuration should be listed by the order of E-UTRA band and NR band respectively, such as for DC\_66\_(n)12 the band order from left to right is 12, 66 and n12. | | | |

**Table 5.45.3-2:ΔRIB,c due to EN-DC (three bands)**

| **Inter-band EN-DC configuration** | **ΔRIB,c for E-UTRA band / NR band (dB)7** | | |
| --- | --- | --- | --- |
| **Component band in order of bands in configuration8** | | |
| DC\_66-71\_n25 | - | - | - |
| NOTE 7: “-” denotes ΔRIB,c = 0.  NOTE 8: The component band order in the configuration should be listed by the order of E-UTRA band and NR band respectively, such as for DC\_5\_(n)12 the band order from left to right is 5, 12 and n12. | | | |

5.45.4 REFSENS requirements

No need to specify additional REFSENS exceptions according to the analysis in clause 5.45.2.

## 5.46 DC\_2-71\_n7

### 5.46.1 Configurations for DC

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

| **EN-DC**  **configuration** | **Uplink EN-DC**  **configuration** |
| --- | --- |
| DC\_2A-71A\_n7A | DC\_2A\_n7A  DC\_71A\_n7A |

### 5.46.2 Co-existence studies

Based on co-existence studies of DC\_2\_n7 and DC\_71\_n7, own Rx impact of the 3rd band is the followings.

- 2nd and 5th order IMD products generated by DC\_2\_n7 uplink may fall into own Rx of band 71.

### 5.46.3 ∆TIB and ∆RIB values

For DC\_2-71\_n7, the ΔTIB,c and ΔRIB,c values are reused from DC\_2-71\_n41 are given in the tables below.

Table 5.46.3-1: ΔTIB,c

| Inter-band EN-DC configuration | ΔTIB,c for E-UTRA band / NR band (dB)6 | | |
| --- | --- | --- | --- |
| Component band in order of bands in configuration7 | | |
| DC\_2-71\_n7 | 0.5 | 0.6 | 0.5 |
| NOTE 6: “-” denotes ΔTIB,c = 0.  NOTE 7: The component band order in the configuration should be listed by the order of E-UTRA band and NR band respectively, such as for DC\_66\_(n)12 the band order from left to right is 12, 66 and n12. | | | |

**Table 5.46.3-2: ΔRIB**

| **nter-band EN-DC configuration** | ΔRIB,c for E-UTRA band / NR band (dB)7 | | |
| --- | --- | --- | --- |
| Component band in order of bands in configuration8 | | |
| DC\_2-71\_n7 | - | 0.2 | - |
| NOTE 7: “-” denotes ΔRIB,c = 0.  NOTE 8: The component band order in the configuration should be listed by the order of E-UTRA band and NR band respectively, such as for DC\_5\_(n)12 the band order from left to right is 5, 12 and n12. | | | |

### 5.46.4 Reference sensitivity exceptions

Table 5.46.4-1 lists the MSD required for the dual connectivity configuration for the cases that IMD interference fall into the own 3rd Rx frequency band. The MSD values for DC\_2A-71A\_n41A are reused.

Table 5.46.4-1: MSD for the DC configuration

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| 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-71A\_n7A | 2 | 1900 | 5 | 25 | 1980 | N/A | N/A |
|  | 71 | 676 | 5 | 50 | 630 | 28.7 | IMD24 |
|  | n7 | 2530 | 10 | 50 | 2650 | N/A | N/A |
| NOTE 4: This band is subject to IMD5 also which MSD is not specified. | | | | | | | |

## 5.47 DC\_2-71\_n77

### 5.47.1 Configurations for DC

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

| **EN-DC**  **configuration** | **Uplink EN-DC**  **configuration** |
| --- | --- |
| DC\_2A-71A\_n77A  DC\_2A-71A\_n77(2A) | DC\_2A\_n77A  DC\_71A\_n77A |

### 5.47.2 Co-existence studies

Based on co-existence studies of DC\_2\_n77 and DC\_71\_n77, own Rx impact of the 3rd band is the followings.

- 3rd and 4th order IMD products generated by DC\_71\_n77 uplink may fall into own Rx of band 2.

### 5.47.3 ∆TIB and ∆RIB values

For DC\_2-71\_n77, the ΔTIB,c and ΔRIB,c values are reused from DC\_2-71\_n78 are given in the tables below.

Table 5.47.3-1: ΔTIB,c

| Inter-band EN-DC configuration | ΔTIB,c for E-UTRA band / NR band (dB)6 | | |
| --- | --- | --- | --- |
| Component band in order of bands in configuration7 | | |
| DC\_2-71\_n77 | 0.6 | 0.6 | 0.8 |
| NOTE 6: “-” denotes ΔTIB,c = 0.  NOTE 7: The component band order in the configuration should be listed by the order of E-UTRA band and NR band respectively, such as for DC\_66\_(n)12 the band order from left to right is 12, 66 and n12. | | | |

**Table 5.47.3-2: ΔRIB**

| **nter-band EN-DC configuration** | ΔRIB,c for E-UTRA band / NR band (dB)7 | | |
| --- | --- | --- | --- |
| Component band in order of bands in configuration8 | | |
| DC\_2-71\_n77 | 0.2 | 0.2 | 0.5 |
| NOTE 7: “-” denotes ΔRIB,c = 0.  NOTE 8: The component band order in the configuration should be listed by the order of E-UTRA band and NR band respectively, such as for DC\_5\_(n)12 the band order from left to right is 5, 12 and n12. | | | |

### 5.47.4 Reference sensitivity exceptions

Table 5.47.4-1 lists the MSD required for the dual connectivity configuration for the cases that IMD interference fall into the own 3rd Rx frequency band. The MSD values for DC\_2A-71A\_n78A are reused.

Table 5.47.4-1: MSD for the DC configuration

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| 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-71A\_n77A  DC\_2A-71A\_n77(2A) | 2 | 1874 | 5 | 25 | 1954 | 16.5 | IMD39 |
|  | 71 | 693 | 5 | 25 | 647 | N/A | N/A |
|  | n77 | 3340 | 10 | 50 | 3340 | N/A | N/A |
| NOTE 9: This band is subject to IMD4 also which MSD is not specified. | | | | | | | |

## 5.48 DC\_7-71\_n77

### 5.48.1 Configurations for DC

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

| **EN-DC**  **configuration** | **Uplink EN-DC**  **configuration** |
| --- | --- |
| DC\_7A-71A\_n77A  DC\_7A-71A\_n77(2A) | DC\_7A\_n77A  DC\_71A\_n77A |

### 5.48.2 Co-existence studies

Based on co-existence studies of DC\_7\_n77 and DC\_71\_n77, own Rx impact of the 3rd band is the followings.

- 2nd and 3rd order IMD products generated by DC\_71\_n77 uplink may fall into own Rx of band 7.

### 5.48.3 ∆TIB and ∆RIB values

For DC\_7-71\_n77, the ΔTIB,c and ΔRIB,c values are reused from DC\_7-71\_n78 are given in the tables below.

Table 5.48.3-1: ΔTIB,c

| Inter-band EN-DC configuration | ΔTIB,c for E-UTRA band / NR band (dB)6 | | |
| --- | --- | --- | --- |
| Component band in order of bands in configuration7 | | |
| DC\_7-71\_n77 | 0.5 | 0.5 | 0.8 |
| NOTE 6: “-” denotes ΔTIB,c = 0.  NOTE 7: The component band order in the configuration should be listed by the order of E-UTRA band and NR band respectively, such as for DC\_66\_(n)12 the band order from left to right is 12, 66 and n12. | | | |

**Table 5.48.3-2: ΔRIB**

| **nter-band EN-DC configuration** | ΔRIB,c for E-UTRA band / NR band (dB)7 | | |
| --- | --- | --- | --- |
| Component band in order of bands in configuration8 | | |
| DC\_7-71\_n77 | 0.2 | 0.5 | 0.5 |
| NOTE 7: “-” denotes ΔRIB,c = 0.  NOTE 8: The component band order in the configuration should be listed by the order of E-UTRA band and NR band respectively, such as for DC\_5\_(n)12 the band order from left to right is 5, 12 and n12. | | | |

### 5.48.4 Reference sensitivity exceptions

Table 5.48.4-1 lists the MSD required for the dual connectivity configuration for the cases that IMD interference fall into the own 3rd Rx frequency band. The MSD values for DC\_7A-71A\_n78A are reused.

Table 5.48.4-1: MSD for the DC configuration

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| 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-71A\_n77A  DC\_7A-71A\_n77(2A) | 7 | 2550 | 5 | 25 | 2670 | 29.6 | IMD21 |
|  | 71 | 680 | 5 | 25 | 634 | N/A | N/A |
|  | n77 | 3350 | 10 | 50 | 3350 | N/A | N/A |
| NOTE 1: This band is subject to IMD3 also which MSD is not specified. | | | | | | | |

## 5.49 DC\_66-71\_n77

### 5.49.1 Configurations for DC

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

| **EN-DC**  **configuration** | **Uplink EN-DC**  **configuration** |
| --- | --- |
| DC\_66A-71A\_n77A  DC\_66A-71A\_n77(2A) | DC\_66A\_n77A  DC\_71A\_n77A |

### 5.49.2 Co-existence studies

Based on co-existence studies of DC\_66\_n77 and DC\_71\_n77, own Rx impact of the 3rd band is the followings.

- 3rd and 4th order IMD products generated by DC\_71\_n77 uplink may fall into own Rx of band 66.

- 3rd order IMD products generated by DC\_66\_n77 uplink may fall into own Rx of band 71.

### 5.49.3 ∆TIB and ∆RIB values

For DC\_66-71\_n77, the ΔTIB,c and ΔRIB,c values are reused from DC\_71\_n66-n78 are given in the tables below.

Table 5.49.3-1: ΔTIB,c

| Inter-band EN-DC configuration | ΔTIB,c for E-UTRA band / NR band (dB)6 | | |
| --- | --- | --- | --- |
| Component band in order of bands in configuration7 | | |
| DC\_66-71\_n77 | 0.6 | 0.6 | 0.8 |
| NOTE 6: “-” denotes ΔTIB,c = 0.  NOTE 7: The component band order in the configuration should be listed by the order of E-UTRA band and NR band respectively, such as for DC\_66\_(n)12 the band order from left to right is 12, 66 and n12. | | | |

**Table 5.49.3-2: ΔRIB**

| **nter-band EN-DC configuration** | ΔRIB,c for E-UTRA band / NR band (dB)7 | | |
| --- | --- | --- | --- |
| Component band in order of bands in configuration8 | | |
| DC\_66-71\_n77 | 0.2 | 0.2 | 0.5 |
| NOTE 7: “-” denotes ΔRIB,c = 0.  NOTE 8: The component band order in the configuration should be listed by the order of E-UTRA band and NR band respectively, such as for DC\_5\_(n)12 the band order from left to right is 5, 12 and n12. | | | |

### 5.49.4 Reference sensitivity exceptions

Table 5.49.4-1 lists the MSD required for the dual connectivity configuration for the cases that IMD interference fall into the own 3rd Rx frequency band. The MSD values for DC\_66A\_n71A-n77A and DC\_71A\_n66A-n78A are reused.

Table 5.49.4-1: MSD for the DC configuration

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| 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\_66A-71A\_n77A  DC\_66A-71A\_n77(2A) | 66 | 1760 | 5 | 25 | 2160 | 15.5 | IMD39 |
|  | 71 | 693 | 5 | 25 | 647 | N/A | N/A |
|  | n77 | 3546 | 10 | 50 | 3546 | N/A | N/A |
|  | 66 | 1720 | 5 | 25 | 2120 | N/A | N/A |
|  | 71 | 686 | 5 | 25 | 640 | 15.3 | IMD311 |
|  | n77 | 4080 | 10 | 50 | 4080 | N/A | N/A |
| NOTE 9: This band is subject to IMD4 also which MSD is not specified.  NOTE 11: For a UE which supports this band combination only when the Band n77 frequency range restriction defined in NOTE 12 of Table 5.2-1 from TS 38.101-1 applies, the MSD test point(s) cannot be verified for the band combination and the test point(s) can be skipped. | | | | | | | |

## 5.50 DC\_7-12\_n77

### 5.50.1 Configurations for DC

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

| **EN-DC**  **configuration** | **Uplink EN-DC**  **configuration** |
| --- | --- |
| DC\_7A-12A\_n77A  DC\_7A-12A\_n77A(2A) | DC\_7A\_n77A  DC\_12A\_n77A |

### 5.50.2 Co-existence studies

Based on co-existence studies of DC\_7\_n77 and DC\_12\_n77, own Rx impact of the 3rd band is the followings.

- 2nd order IMD products generated by DC\_7\_n77 uplink may fall into own Rx of band 12.

- 2nd and 3rd order IMD products generated by DC\_12\_n77 uplink may fall into own Rx of band 7.

### 5.50.3 ∆TIB and ∆RIB values

For DC\_7-12\_n77, the ΔTIB,c and ΔRIB,c values are reused from DC\_7-12\_n78 are given in the tables below.

Table 5.50.3-1: ΔTIB,c

| Inter-band EN-DC configuration | ΔTIB,c for E-UTRA band / NR band (dB)6 | | |
| --- | --- | --- | --- |
| Component band in order of bands in configuration7 | | |
| DC\_7-12\_n77 | 0.5 | 0.5 | 0.8 |
| NOTE 6: “-” denotes ΔTIB,c = 0.  NOTE 7: The component band order in the configuration should be listed by the order of E-UTRA band and NR band respectively, such as for DC\_66\_(n)12 the band order from left to right is 12, 66 and n12. | | | |

**Table 5.50.3-2: ΔRIB**

| **Inter-band EN-DC configuration** | ΔRIB,c for E-UTRA band / NR band (dB)7 | | |
| --- | --- | --- | --- |
| Component band in order of bands in configuration8 | | |
| DC\_7-12\_n77 | 0.2 | 0.5 | 0.5 |
| NOTE 7: “-” denotes ΔRIB,c = 0.  NOTE 8: The component band order in the configuration should be listed by the order of E-UTRA band and NR band respectively, such as for DC\_5\_(n)12 the band order from left to right is 5, 12 and n12. | | | |

### 5.50.4 Reference sensitivity exceptions

Table 5.50.4-1 lists the MSD required for the dual connectivity configuration for the cases that IMD interference fall into the own 3rd Rx frequency band. The MSD values for DC\_7A-12A\_n78A are reused.

Table 5.50.4-1: MSD for the DC configuration

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| 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-12A\_n77A  DC\_7A-12A\_n77(2A) | 7 | 2542 | 5 | 25 | 2662 | 29.6 | IMD21 |
|  | 12 | 708 | 5 | 25 | 738 | N/A | N/A |
|  | n77 | 3370 | 10 | 50 | 3370 | N/A | N/A |
|  | 7 | 2565 | 5 | 25 | 2685 | N/A | N/A |
|  | 12 | 710 | 5 | 25 | 740 | 30.8 | IMD2 |
|  | n77 | 3305 | 10 | 50 | 3305 | N/A | N/A |
| NOTE 1: This band is subject to IMD3 also which MSD is not specified. | | | | | | | |

## 5.51 DC\_7-12\_n25

### 5.51.1 Configurations for DC

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

| **EN-DC**  **configuration** | **Uplink EN-DC**  **configuration** |
| --- | --- |
| DC\_7A-12A\_n25A | DC\_7A\_n25A  DC\_12A\_n25A |

### 5.51.2 Co-existence studies

Based on co-existence studies of DC\_7\_n25 and DC\_12\_n25, own Rx impact of the 3rd band is the followings.

- 5th order IMD products generated by DC\_7\_n25 uplink may fall into own Rx of band 12.

- 2nd order IMD products generated by DC\_12\_n25 uplink may fall into own Rx of band 7.

### 5.51.3 ∆TIB and ∆RIB values

For DC\_7-12\_n25, the ΔTIB,c and ΔRIB,c values are reused from DC\_7-13\_n25are given in the tables below.

Table 5.51.3-1: ΔTIB,c

| Inter-band EN-DC configuration | ΔTIB,c for E-UTRA band / NR band (dB)6 | | |
| --- | --- | --- | --- |
| Component band in order of bands in configuration7 | | |
| DC\_7-12\_n25 | 0.5 | 0.3 | 0.5 |
| NOTE 6: “-” denotes ΔTIB,c = 0.  NOTE 7: The component band order in the configuration should be listed by the order of E-UTRA band and NR band respectively, such as for DC\_66\_(n)12 the band order from left to right is 12, 66 and n12. | | | |

**Table 5.51.3-2: ΔRIB**

| **Inter-band EN-DC configuration** | ΔRIB,c for E-UTRA band / NR band (dB)7 | | |
| --- | --- | --- | --- |
| Component band in order of bands in configuration8 | | |
| DC\_7-12\_n25 | - | - | - |
| NOTE 7: “-” denotes ΔRIB,c = 0.  NOTE 8: The component band order in the configuration should be listed by the order of E-UTRA band and NR band respectively, such as for DC\_5\_(n)12 the band order from left to right is 5, 12 and n12. | | | |

### 5.51.4 Reference sensitivity exceptions

Table 5.51.4-1 lists the MSD required for the dual connectivity configuration for the cases that IMD interference fall into the own 3rd Rx frequency band. The MSD values for DC\_7A-12A\_n2A are reused.

Table 5.51.4-1: MSD for the DC configuration

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| 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-12A\_n25A | 7 | 2502.5 | 5 | 25 | 2622.5 | N/A | N/A |
|  | 12 | 701.5 | 5 | 25 | 731.5 | 5.3 | IMD5 |
|  | n25 | 1907.5 | 5 | 25 | 1987.5 | N/A | N/A |
|  | 7 | 2502.5 | 5 | 25 | 2622.5 | 30.8 | IMD2 |
|  | 12 | 713.5 | 5 | 25 | 743.5 | N/A | N/A |
|  | n25 | 1907.5 | 5 | 25 | 1987.5 | N/A | N/A |

## 5.52 DC\_7-66\_n12

### 5.52.1 Configurations for DC

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

| **EN-DC**  **configuration** | **Uplink EN-DC**  **configuration** |
| --- | --- |
| DC\_7A-66A\_n12A | DC\_7A\_n12A  DC\_66A\_n12A |

### 5.52.2 Co-existence studies

Based on co-existence studies of DC\_7\_n12 and DC\_66\_n12 on own Rx impact of the 3rd band, there is no IMD interference for this band combination.

### 5.52.3 ∆TIB and ∆RIB values

For DC\_7-66\_n12, the ΔTIB,c and ΔRIB,c values are reused from DC\_12\_n7-n66 are given in the tables below.

Table 5.52.3-1: ΔTIB,c

| Inter-band EN-DC configuration | ΔTIB,c for E-UTRA band / NR band (dB)6 | | |
| --- | --- | --- | --- |
| Component band in order of bands in configuration7 | | |
| DC\_7-66\_n12 | 0.5 | 0.5 | 0.8 |
| NOTE 6: “-” denotes ΔTIB,c = 0.  NOTE 7: The component band order in the configuration should be listed by the order of E-UTRA band and NR band respectively, such as for DC\_66\_(n)12 the band order from left to right is 12, 66 and n12. | | | |

**Table 5.52.3-2: ΔRIB**

| **nter-band EN-DC configuration** | ΔRIB,c for E-UTRA band / NR band (dB)7 | | |
| --- | --- | --- | --- |
| Component band in order of bands in configuration8 | | |
| DC\_7-66\_n12 | 0.5 | 0.5 | 0.5 |
| NOTE 7: “-” denotes ΔRIB,c = 0.  NOTE 8: The component band order in the configuration should be listed by the order of E-UTRA band and NR band respectively, such as for DC\_5\_(n)12 the band order from left to right is 5, 12 and n12. | | | |

### 5.52.4 Reference sensitivity exceptions

There is no IMD interference for this combination, thus there is no MSD requirement.

## 5.53 DC\_7-71\_n25

### 5.53.1 Configurations for DC

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

| **EN-DC**  **configuration** | **Uplink EN-DC**  **configuration** |
| --- | --- |
| DC\_7A-71A\_n25A | DC\_7A\_n25A  DC\_71A\_n25A |

### 5.53.2 Co-existence studies

Based on co-existence studies of DC\_7\_n25 and DC\_71\_n25, own Rx impact of the 3rd band is the followings.

- 2nd and 5th order IMD products generated by DC\_7\_n25 uplink may fall into own Rx of band 71.

### 5.53.3 ∆TIB and ∆RIB values

For DC\_7-71\_n25, the ΔTIB,c and ΔRIB,c values are reused from DC\_7\_n2-n71

Table 5.53.3-1: ΔTIB,c

| Inter-band EN-DC configuration | ΔTIB,c for E-UTRA band / NR band (dB)6 | | |
| --- | --- | --- | --- |
| Component band in order of bands in configuration7 | | |
| DC\_7-71\_n25 | 0.5 | 0.3 | 0.5 |
| NOTE 6: “-” denotes ΔTIB,c = 0.  NOTE 7: The component band order in the configuration should be listed by the order of E-UTRA band and NR band respectively, such as for DC\_66\_(n)12 the band order from left to right is 12, 66 and n12. | | | |

**Table 5.53.3-2: ΔRIB**

| **Inter-band EN-DC configuration** | ΔRIB,c for E-UTRA band / NR band (dB)7 | | |
| --- | --- | --- | --- |
| Component band in order of bands in configuration8 | | |
| DC\_7-71\_n25 | 0.3 | - | 0.3 |
| NOTE 7: “-” denotes ΔRIB,c = 0.  NOTE 8: The component band order in the configuration should be listed by the order of E-UTRA band and NR band respectively, such as for DC\_5\_(n)12 the band order from left to right is 5, 12 and n12. | | | |

### 5.53.4 Reference sensitivity exceptions

Table 5.53.4-1 lists the MSD required for the dual connectivity configuration for the cases that IMD interference fall into the own 3rd Rx frequency band. The MSD values for DC\_7A\_n2A-n71A are reused.

Table 5.53.4-1: MSD for the DC configuration

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| 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-71A\_n25A | 7 | 2530 | 5 | 25 | 2530 | N/A | N/A |
|  | 71 | 676 | 5 | 25 | 630 | 28.7 | IMD24 |
|  | n25 | 1900 | 5 | 25 | 1980 | N/A | N/A |
| NOTE 4: This band is subject to IMD5 also which MSD is not specified. | | | | | | | |

## 5.54 DC\_12-66\_n7

### 5.54.1 Configurations for DC

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

| **EN-DC**  **configuration** | **Uplink EN-DC**  **configuration** |
| --- | --- |
| DC\_12A-66A\_n7A | DC\_12A\_n7A  DC\_66A\_n7A |

### 5.54.2 Co-existence studies

Based on co-existence studies of DC\_12\_n7 and DC\_66\_n7, own Rx impact of the 3rd band is the followings.

- 2nd order IMD products generated by DC\_66\_n7 uplink may fall into own Rx of band 12.

### 5.54.3 ∆TIB and ∆RIB values

For DC\_12-66\_n7, the ΔTIB,c and ΔRIB,c values are reused from DC\_12-66\_n41 are given in the tables below.

Table 5.54.3-1: ΔTIB,c

| Inter-band EN-DC configuration | ΔTIB,c for E-UTRA band / NR band (dB)6 | | |
| --- | --- | --- | --- |
| Component band in order of bands in configuration7 | | |
| DC\_12-66\_n7 | 0.6 | 0.5 | 0.8 |
| NOTE 6: “-” denotes ΔTIB,c = 0.  NOTE 7: The component band order in the configuration should be listed by the order of E-UTRA band and NR band respectively, such as for DC\_66\_(n)12 the band order from left to right is 12, 66 and n12. | | | |

**Table 5.54.3-2: ΔRIB**

| **nter-band EN-DC configuration** | ΔRIB,c for E-UTRA band / NR band (dB)7 | | |
| --- | --- | --- | --- |
| Component band in order of bands in configuration8 | | |
| DC\_12-66\_n7 | 0.5 | 0.5 | 0.5 |
| NOTE 7: “-” denotes ΔRIB,c = 0.  NOTE 8: The component band order in the configuration should be listed by the order of E-UTRA band and NR band respectively, such as for DC\_5\_(n)12 the band order from left to right is 5, 12 and n12. | | | |

### 5.54.4 Reference sensitivity exceptions

Table 5.54.4-1 lists the MSD required for the dual connectivity configuration for the cases that IMD interference fall into the own 3rd Rx frequency band. The MSD values for DC\_12A-66A\_n41A are reused.

Table 5.54.4-1: MSD for the DC configuration

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| 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\_12A-66A\_n7A | 12 | 712 | 5 | 25 | 742 | 31 | IMD2 |
|  | 66 | 1773 | 5 | 25 | 2173 | N/A | N/A |
|  | n7 | 2515 | 5 | 25 | 2635 | N/A | N/A |

## 5.55 DC\_66-71\_n7

### 5.55.1 Configurations for DC

Table 5.55.1-1: Inter-band DC configurations (three bands)

| **EN-DC**  **configuration** | **Uplink EN-DC**  **configuration** |
| --- | --- |
| DC\_66A-71A\_n7A | DC\_66A\_n7A  DC\_71A\_n7A |

### 5.55.2 Co-existence studies

Based on co-existence studies of DC\_66\_n7 and DC\_71\_n7 on own Rx impact of the 3rd band, there is no IMD interference for this band combination.

### 5.55.3 ∆TIB and ∆RIB values

For DC\_66-71\_n7, the ΔTIB,c and ΔRIB,c values are reused from DC\_66-71\_n41 are given in the tables below.

Table 5.55.3-1: ΔTIB,c

| Inter-band EN-DC configuration | ΔTIB,c for E-UTRA band / NR band (dB)6 | | |
| --- | --- | --- | --- |
| Component band in order of bands in configuration7 | | |
| DC\_66-71\_n7 | 0.5 | 0.6 | 0.8 |
| NOTE 6: “-” denotes ΔTIB,c = 0.  NOTE 7: The component band order in the configuration should be listed by the order of E-UTRA band and NR band respectively, such as for DC\_66\_(n)12 the band order from left to right is 12, 66 and n12. | | | |

**Table 5.55.3-2: ΔRIB**

| **nter-band EN-DC configuration** | ΔRIB,c for E-UTRA band / NR band (dB)7 | | |
| --- | --- | --- | --- |
| Component band in order of bands in configuration8 | | |
| DC\_66-71\_n7 | 0.5 | 0.5 | 0.5 |
| NOTE 7: “-” denotes ΔRIB,c = 0.  NOTE 8: The component band order in the configuration should be listed by the order of E-UTRA band and NR band respectively, such as for DC\_5\_(n)12 the band order from left to right is 5, 12 and n12. | | | |

### 5.55.4 Reference sensitivity exceptions

There is no IMD interference for this combination, thus there is no MSD requirement.

## 5.56 DC\_1A-3A\_n105A

### 5.56.1 Operating bands for EN-DC

Table 5.56.1-1: EN-DC Band combinations (three bands)

| EN-DC band | E-UTRA CA band | NR band | Single UL allowed |
| --- | --- | --- | --- |
| DC\_1-3\_n105 | CA\_1-3 | n105 | No |

### 5.56.2 Configuration for DC

Table 5.56.2-1: Inter-band EN-DC configurations (three bands)

| EN-DC  Configuration | Uplink EN-DC  configuration  (NOTE 1) | E-UTRA CA configuration | NR band |
| --- | --- | --- | --- |
| DC\_1A-3A\_n105A | DC\_1A\_n105A  DC\_3A\_n105A | CA\_1A-3A | n105A |

5.56.3 Co-existence studies

This is a 3-band combination, so uplink harmonic and harmonic mixing analysis is already done in the fallbacks. Only IMD for two uplink configurations is analysed.

A study of the uplink combination affecting the downlink of the third band is shown in Table 5.56.3-1 for DC\_1A\_n105A into band 3 downlink.

Table 5.56.3-1: IMD analysis for DC\_1A\_n105A

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **UE UL carriers** | **fx\_low** | **fx\_high** | **fy\_low** | **fy\_high** |
| UL Frequency [MHz] | 1920 | 1980 | 663 | 703 |
| DL Frequency [MHz] | 2110 | 2170 | 612 | 652 |
| 2nd order IMD products | |fy\_low – fx\_high| | |fy\_high – fx\_low| | |fy\_low + fx\_low| | |fy\_high + fx\_high| |
| IMD frequency limits (MHz) | 1317 | 1217 | 2583 | 2683 |
| 3rd order IMD products | |2\*fx\_low – fy\_high| | |2\*fx\_high – fy\_low| | |2\*fy\_low – fx\_high| | |2\*fy\_high – fx\_low| |
| IMD frequency limits (MHz) | 3137 | 3297 | 654 | 514 |
| 3rd order IMD products | |2\*fx\_low + fy\_low| | |2\*fx\_high + fy\_high| | |2\*fy\_low + fx\_low| | |2\*fy\_high + fx\_high| |
| IMD frequency limits (MHz) | 4503 | 4663 | 3246 | 3386 |
| Two-tone 4th order IMD products | |3\*fx\_low –1\* fy\_high| | |3\*fx\_high – 1\*fy\_low| | |3\*fy\_low – 1\*fx\_high| | |3\*fy\_high – 1\*fx\_low| |
| IMD frequency limits (MHz) | 5057 | 5277 | 9 | 189 |
| Two-tone 4th order IMD products | |2\*fx\_low –2\* fy\_high| | |2\*fx\_high –2\* fy\_low| | |2\*fx\_low +2\* fy\_low| | |2\*fx\_high +2\* fy\_high| |
| IMD frequency limits (MHz) | 2434 | 2634 | 5166 | 5366 |
| Two-tone 4th order IMD products | |3\*fx\_low +1\* fy\_low| | |3\*fx\_high + 1\*fy\_high| | |3\*fy\_low + 1\*fx\_low| | |3\*fy\_high + 1\*fx\_high| |
| IMD frequency limits (MHz) | 6423 | 6643 | 3909 | 4089 |
| Two-tone 5th order IMD products | |fx\_low – 4\*fy\_high| | |fx\_high – 4\*fy\_low| | |fy\_low – 4\*fx\_high| | |fy\_high – 4\*fx\_low| |
| IMD frequency limits (MHz) | 892 | 672 | 7257 | 6977 |
| Two-tone 5th order IMD products | |2\*fx\_low - 3\*fy\_high| | |2\*fx\_high - 3\*fy\_low| | |2\*fy\_low - 3\*fx\_high| | |2\*fy\_high -3\*fx\_low| |
| IMD frequency limits (MHz) | 1731 | 1971 | 4614 | 4354 |
| Two-tone 5th order IMD products | |fx\_low + 4\*fy\_low| | |fx\_high + 4\*fy\_high| | |fy\_low + 4\*fx\_low| | |fy\_high + 4\*fx\_high| |
| IMD frequency limits (MHz) | 4572 | 4792 | 8343 | 8623 |
| Two-tone 5th order IMD products | |2\*fx\_low + 3\*fy\_low| | |2\*fx\_high + 3\*fy\_high| | |2\*fy\_low + 3\*fx\_low| | |2\*fy\_high + 3\*fx\_high| |
| IMD frequency limits (MHz) | 5829 | 6069 | 7086 | 7346 |

A study of the uplink combination affecting the downlink of the third band is shown in Table 5.56.3-2 for DC\_3A\_n105A into band 1 downlink.

Table 5.56.3-2: IMD analysis for DC\_3A\_n105A

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **UE UL carriers** | **fx\_low** | **fx\_high** | **fy\_low** | **fy\_high** |
| UL Frequency [MHz] | 1710 | 1785 | 663 | 703 |
| DL Frequency [MHz] | 1805 | 1880 | 612 | 652 |
| 2nd order IMD products | |fy\_low – fx\_high| | |fy\_high – fx\_low| | |fy\_low + fx\_low| | |fy\_high + fx\_high| |
| IMD frequency limits (MHz) | 1122 | 1007 | 2373 | 2488 |
| 3rd order IMD products | |2\*fx\_low – fy\_high| | |2\*fx\_high – fy\_low| | |2\*fy\_low – fx\_high| | |2\*fy\_high – fx\_low| |
| IMD frequency limits (MHz) | 2717 | 2907 | 459 | 304 |
| 3rd order IMD products | |2\*fx\_low + fy\_low| | |2\*fx\_high + fy\_high| | |2\*fy\_low + fx\_low| | |2\*fy\_high + fx\_high| |
| IMD frequency limits (MHz) | 4083 | 4273 | 3036 | 3191 |
| Two-tone 4th order IMD products | |3\*fx\_low –1\* fy\_high| | |3\*fx\_high – 1\*fy\_low| | |3\*fy\_low – 1\*fx\_high| | |3\*fy\_high – 1\*fx\_low| |
| IMD frequency limits (MHz) | 4427 | 4692 | 204 | 399 |
| Two-tone 4th order IMD products | |2\*fx\_low –2\* fy\_high| | |2\*fx\_high –2\* fy\_low| | |2\*fx\_low +2\* fy\_low| | |2\*fx\_high +2\* fy\_high| |
| IMD frequency limits (MHz) | 2014 | 2244 | 4746 | 4976 |
| Two-tone 4th order IMD products | |3\*fx\_low +1\* fy\_low| | |3\*fx\_high + 1\*fy\_high| | |3\*fy\_low + 1\*fx\_low| | |3\*fy\_high + 1\*fx\_high| |
| IMD frequency limits (MHz) | 5793 | 6058 | 3699 | 3894 |
| Two-tone 5th order IMD products | |fx\_low – 4\*fy\_high| | |fx\_high – 4\*fy\_low| | |fy\_low – 4\*fx\_high| | |fy\_high – 4\*fx\_low| |
| IMD frequency limits (MHz) | 1102 | 867 | 6477 | 6137 |
| Two-tone 5th order IMD products | |2\*fx\_low - 3\*fy\_high| | |2\*fx\_high - 3\*fy\_low| | |2\*fy\_low - 3\*fx\_high| | |2\*fy\_high -3\*fx\_low| |
| IMD frequency limits (MHz) | 1311 | 1581 | 4029 | 3724 |
| Two-tone 5th order IMD products | |fx\_low + 4\*fy\_low| | |fx\_high + 4\*fy\_high| | |fy\_low + 4\*fx\_low| | |fy\_high + 4\*fx\_high| |
| IMD frequency limits (MHz) | 4362 | 4597 | 7503 | 7843 |
| Two-tone 5th order IMD products | |2\*fx\_low + 3\*fy\_low| | |2\*fx\_high + 3\*fy\_high| | |2\*fy\_low + 3\*fx\_low| | |2\*fy\_high + 3\*fx\_high| |
| IMD frequency limits (MHz) | 5409 | 5679 | 6456 | 6761 |

Based on Table 5.56.3-1 and Table 5.56.3-2:

* The 5th order IMD product of DC\_1\_n105 falls inside band 3 downlink
* The 4th order IMD product of DC\_3\_n105 falls inside band 1 downlink

5.56.4 ∆TIB and ∆RIB values

For DC\_1-3\_n105, the ΔTIB,c and ΔRIB,c values are taken from fallbacks.

**Table 5.56.4-1:ΔTIB,c due to EN-DC (three bands)**

| Inter-band EN-DC configuration | ΔTIB,c for E-UTRA band / NR band (dB)6 | | |
| --- | --- | --- | --- |
| Component band in order of bands in configuration7 | | |
| DC\_1-3\_n105 | 0.3 | 0.3 | 0.6 |
| NOTE 6: “-” denotes ΔTIB,c = 0.  NOTE 7: The component band order in the configuration should be listed by the order of E-UTRA band and NR band respectively, such as for DC\_66\_(n)12 the band order from left to right is 12, 66 and n12. | | | |

**Table 5.56.4-2:ΔRIB,c due to EN-DC (three bands)**

| **Inter-band EN-DC configuration** | ΔRIB,c for E-UTRA band / NR band (dB)7 | | |
| --- | --- | --- | --- |
| Component band in order of bands in configuration8 | | |
| DC\_1-3\_n105 | - | - | 0.3 |
| NOTE 7: “-” denotes ΔRIB,c = 0.  NOTE 8: The component band order in the configuration should be listed by the order of E-UTRA band and NR band respectively, such as for DC\_5\_(n)12 the band order from left to right is 5, 12 and n12. | | | |

5.56.5 REFSENS requirements

MSD values are reused from DC\_1A-3A\_n71A and DC\_1A-3A\_n28A. The test frequencies are not re-used.

Table 5.56.5-1: 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\_n105A | 1 | 1970 | 5 | 25 | 2160 | N/A | N/A |
|  | 3 | 1760 | 5 | 25 | 1855 | 4 | IMD5 |
|  | n105 | 695 | 5 | 25 | 644 | N/A | N/A |
|  | 1 | 1970 | 5 | 25 | 2160 | 5 | IMD4 |
|  | 3 | 1775 | 5 | 25 | 1870 | N/A | N/A |
|  | n105 | 695 | 5 | 25 | 644 | N/A | N/A |

## 5.57 DC\_1A-7A\_n105A

### 5.57.1 Operating bands for EN-DC

Table 5.57.1-1: EN-DC Band combinations (three bands)

| EN-DC band | E-UTRA CA band | NR band | Single UL allowed |
| --- | --- | --- | --- |
| DC\_1-7\_n105 | CA\_1-7 | n105 | No |

### 5.57.2 Configuration for DC

Table 5.57.2-1: Inter-band EN-DC configurations (three bands)

| EN-DC  Configuration | Uplink EN-DC  configuration  (NOTE 1) | E-UTRA CA configuration | NR band |
| --- | --- | --- | --- |
| DC\_1A-7A\_n105A | DC\_1A\_n105A  DC\_7A\_n105A | CA\_1A-7A | n105A |

5.57.3 Co-existence studies

This is a 3-band combination, so uplink harmonic and harmonic mixing analysis is already done in the fallbacks. Only IMD for two uplink configurations is analysed.

A study of the uplink combination affecting the downlink of the third band is shown in Table 5.57.3-1 for DC\_1A\_n105A into band 7 downlink.

Table 5.57.3-1: IMD analysis for DC\_1A\_n105A

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **UE UL carriers** | **fx\_low** | **fx\_high** | **fy\_low** | **fy\_high** |
| UL Frequency [MHz] | 1920 | 1980 | 663 | 703 |
| DL Frequency [MHz] | 2110 | 2170 | 612 | 652 |
| 2nd order IMD products | |fy\_low – fx\_high| | |fy\_high – fx\_low| | |fy\_low + fx\_low| | |fy\_high + fx\_high| |
| IMD frequency limits (MHz) | 1317 | 1217 | 2583 | 2683 |
| 3rd order IMD products | |2\*fx\_low – fy\_high| | |2\*fx\_high – fy\_low| | |2\*fy\_low – fx\_high| | |2\*fy\_high – fx\_low| |
| IMD frequency limits (MHz) | 3137 | 3297 | 654 | 514 |
| 3rd order IMD products | |2\*fx\_low + fy\_low| | |2\*fx\_high + fy\_high| | |2\*fy\_low + fx\_low| | |2\*fy\_high + fx\_high| |
| IMD frequency limits (MHz) | 4503 | 4663 | 3246 | 3386 |
| Two-tone 4th order IMD products | |3\*fx\_low –1\* fy\_high| | |3\*fx\_high – 1\*fy\_low| | |3\*fy\_low – 1\*fx\_high| | |3\*fy\_high – 1\*fx\_low| |
| IMD frequency limits (MHz) | 5057 | 5277 | 9 | 189 |
| Two-tone 4th order IMD products | |2\*fx\_low –2\* fy\_high| | |2\*fx\_high –2\* fy\_low| | |2\*fx\_low +2\* fy\_low| | |2\*fx\_high +2\* fy\_high| |
| IMD frequency limits (MHz) | 2434 | 2634 | 5166 | 5366 |
| Two-tone 4th order IMD products | |3\*fx\_low +1\* fy\_low| | |3\*fx\_high + 1\*fy\_high| | |3\*fy\_low + 1\*fx\_low| | |3\*fy\_high + 1\*fx\_high| |
| IMD frequency limits (MHz) | 6423 | 6643 | 3909 | 4089 |
| Two-tone 5th order IMD products | |fx\_low – 4\*fy\_high| | |fx\_high – 4\*fy\_low| | |fy\_low – 4\*fx\_high| | |fy\_high – 4\*fx\_low| |
| IMD frequency limits (MHz) | 892 | 672 | 7257 | 6977 |
| Two-tone 5th order IMD products | |2\*fx\_low - 3\*fy\_high| | |2\*fx\_high - 3\*fy\_low| | |2\*fy\_low - 3\*fx\_high| | |2\*fy\_high -3\*fx\_low| |
| IMD frequency limits (MHz) | 1731 | 1971 | 4614 | 4354 |
| Two-tone 5th order IMD products | |fx\_low + 4\*fy\_low| | |fx\_high + 4\*fy\_high| | |fy\_low + 4\*fx\_low| | |fy\_high + 4\*fx\_high| |
| IMD frequency limits (MHz) | 4572 | 4792 | 8343 | 8623 |
| Two-tone 5th order IMD products | |2\*fx\_low + 3\*fy\_low| | |2\*fx\_high + 3\*fy\_high| | |2\*fy\_low + 3\*fx\_low| | |2\*fy\_high + 3\*fx\_high| |
| IMD frequency limits (MHz) | 5829 | 6069 | 7086 | 7346 |

Based on Table 5.57.3-1:

* The 2nd order IMD product of DC\_1\_n105 falls inside band 7 downlink

A study of the uplink combination affecting the downlink of the third band is shown in Table 5.57.3-2 for DC\_7A\_n105A into band 1 downlink.

Table 5.57.3-2: IMD analysis for DC\_7A\_n105A

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **UE UL carriers** | **fx\_low** | **fx\_high** | **fy\_low** | **fy\_high** |
| UL Frequency [MHz] | 2500 | 2570 | 663 | 703 |
| DL Frequency [MHz] | 2620 | 2690 | 612 | 652 |
| 2nd order IMD products | |fy\_low – fx\_high| | |fy\_high – fx\_low| | |fy\_low + fx\_low| | |fy\_high + fx\_high| |
| IMD frequency limits (MHz) | 1907 | 1797 | 3163 | 3273 |
| 3rd order IMD products | |2\*fx\_low – fy\_high| | |2\*fx\_high – fy\_low| | |2\*fy\_low – fx\_high| | |2\*fy\_high – fx\_low| |
| IMD frequency limits (MHz) | 4297 | 4477 | 1244 | 1094 |
| 3rd order IMD products | |2\*fx\_low + fy\_low| | |2\*fx\_high + fy\_high| | |2\*fy\_low + fx\_low| | |2\*fy\_high + fx\_high| |
| IMD frequency limits (MHz) | 5663 | 5843 | 3826 | 3976 |
| Two-tone 4th order IMD products | |3\*fx\_low –1\* fy\_high| | |3\*fx\_high – 1\*fy\_low| | |3\*fy\_low – 1\*fx\_high| | |3\*fy\_high – 1\*fx\_low| |
| IMD frequency limits (MHz) | 6797 | 7047 | 581 | 391 |
| Two-tone 4th order IMD products | |2\*fx\_low –2\* fy\_high| | |2\*fx\_high –2\* fy\_low| | |2\*fx\_low +2\* fy\_low| | |2\*fx\_high +2\* fy\_high| |
| IMD frequency limits (MHz) | 3594 | 3814 | 6326 | 6546 |
| Two-tone 4th order IMD products | |3\*fx\_low +1\* fy\_low| | |3\*fx\_high + 1\*fy\_high| | |3\*fy\_low + 1\*fx\_low| | |3\*fy\_high + 1\*fx\_high| |
| IMD frequency limits (MHz) | 8163 | 8413 | 4489 | 4679 |
| Two-tone 5th order IMD products | |fx\_low – 4\*fy\_high| | |fx\_high – 4\*fy\_low| | |fy\_low – 4\*fx\_high| | |fy\_high – 4\*fx\_low| |
| IMD frequency limits (MHz) | 312 | 82 | 9617 | 9297 |
| Two-tone 5th order IMD products | |2\*fx\_low - 3\*fy\_high| | |2\*fx\_high - 3\*fy\_low| | |2\*fy\_low - 3\*fx\_high| | |2\*fy\_high -3\*fx\_low| |
| IMD frequency limits (MHz) | 2891 | 3151 | 6384 | 6094 |
| Two-tone 5th order IMD products | |fx\_low + 4\*fy\_low| | |fx\_high + 4\*fy\_high| | |fy\_low + 4\*fx\_low| | |fy\_high + 4\*fx\_high| |
| IMD frequency limits (MHz) | 5152 | 5382 | 10663 | 10983 |
| Two-tone 5th order IMD products | |2\*fx\_low + 3\*fy\_low| | |2\*fx\_high + 3\*fy\_high| | |2\*fy\_low + 3\*fx\_low| | |2\*fy\_high + 3\*fx\_high| |
| IMD frequency limits (MHz) | 6989 | 7249 | 8826 | 9116 |

The analysis shows there is no IMD issues of this uplink combination.

5.57.4 ∆TIB and ∆RIB values

For DC\_1-7\_n105, the ΔTIB,c and ΔRIB,c values are taken from fallbacks.

**Table 5.57.4-1:ΔTIB,c due to EN-DC (three bands)**

| Inter-band EN-DC configuration | ΔTIB,c for E-UTRA band / NR band (dB)6 | | |
| --- | --- | --- | --- |
| Component band in order of bands in configuration7 | | |
| DC\_1-7\_n105 | 0.5 | 0.6 | 0.6 |
| NOTE 6: “-” denotes ΔTIB,c = 0.  NOTE 7: The component band order in the configuration should be listed by the order of E-UTRA band and NR band respectively, such as for DC\_66\_(n)12 the band order from left to right is 12, 66 and n12. | | | |

**Table 5.57.4-2:ΔRIB,c due to EN-DC (three bands)**

| **Inter-band EN-DC configuration** | ΔRIB,c for E-UTRA band / NR band (dB)7 | | |
| --- | --- | --- | --- |
| Component band in order of bands in configuration8 | | |
| DC\_1-7\_n105 | - | - | 0.3 |
| NOTE 7: “-” denotes ΔRIB,c = 0.  NOTE 8: The component band order in the configuration should be listed by the order of E-UTRA band and NR band respectively, such as for DC\_5\_(n)12 the band order from left to right is 5, 12 and n12. | | | |

5.57.5 REFSENS requirements

MSD values are reused from CA\_n1-n7-n28. The test frequencies are not re-used.

Table 5.57.5-1: 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-7A\_n105A | 1 | 1975 | 5 | 25 | 2165 | N/A | N/A |
|  | 7 | 2553 | 5 | 25 | 2673 | 30 | IMD2 |
|  | n105 | 698 | 5 | 25 | 647 | N/A | N/A |

## 5.58 DC\_3A-7A\_n105A

### 5.58.1 Operating bands for EN-DC

Table 5.58.1-1: EN-DC Band combinations (three bands)

| EN-DC band | E-UTRA CA band | NR band | Single UL allowed |
| --- | --- | --- | --- |
| DC\_3-7\_n105 | CA\_3-7 | n105 | No |

### 5.58.2 Configuration for DC

Table 5.58.2-1: Inter-band EN-DC configurations (three bands)

| EN-DC  Configuration | Uplink EN-DC  configuration  (NOTE 1) | E-UTRA CA configuration | NR band |
| --- | --- | --- | --- |
| DC\_3A-7A\_n105A | DC\_3A\_n105A  DC\_7A\_n105A | CA\_3A-7A | n105A |

5.58.3 Co-existence studies

This is a 3-band combination, so uplink harmonic and harmonic mixing analysis is already done in the fallbacks. Only IMD for two uplink configurations is analysed.

A study of the uplink combination affecting the downlink of the third band is shown in Table 5.58.3-1 for DC\_3A\_n105A into band 7 downlink.

Table 5.58.3-1: IMD analysis for DC\_3A\_n105A

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **UE UL carriers** | **fx\_low** | **fx\_high** | **fy\_low** | **fy\_high** |
| UL Frequency [MHz] | 1710 | 1785 | 663 | 703 |
| DL Frequency [MHz] | 1805 | 1880 | 612 | 652 |
| 2nd order IMD products | |fy\_low – fx\_high| | |fy\_high – fx\_low| | |fy\_low + fx\_low| | |fy\_high + fx\_high| |
| IMD frequency limits (MHz) | 1122 | 1007 | 2373 | 2488 |
| 3rd order IMD products | |2\*fx\_low – fy\_high| | |2\*fx\_high – fy\_low| | |2\*fy\_low – fx\_high| | |2\*fy\_high – fx\_low| |
| IMD frequency limits (MHz) | 2717 | 2907 | 459 | 304 |
| 3rd order IMD products | |2\*fx\_low + fy\_low| | |2\*fx\_high + fy\_high| | |2\*fy\_low + fx\_low| | |2\*fy\_high + fx\_high| |
| IMD frequency limits (MHz) | 4083 | 4273 | 3036 | 3191 |
| Two-tone 4th order IMD products | |3\*fx\_low –1\* fy\_high| | |3\*fx\_high – 1\*fy\_low| | |3\*fy\_low – 1\*fx\_high| | |3\*fy\_high – 1\*fx\_low| |
| IMD frequency limits (MHz) | 4427 | 4692 | 204 | 399 |
| Two-tone 4th order IMD products | |2\*fx\_low –2\* fy\_high| | |2\*fx\_high –2\* fy\_low| | |2\*fx\_low +2\* fy\_low| | |2\*fx\_high +2\* fy\_high| |
| IMD frequency limits (MHz) | 2014 | 2244 | 4746 | 4976 |
| Two-tone 4th order IMD products | |3\*fx\_low +1\* fy\_low| | |3\*fx\_high + 1\*fy\_high| | |3\*fy\_low + 1\*fx\_low| | |3\*fy\_high + 1\*fx\_high| |
| IMD frequency limits (MHz) | 5793 | 6058 | 3699 | 3894 |
| Two-tone 5th order IMD products | |fx\_low – 4\*fy\_high| | |fx\_high – 4\*fy\_low| | |fy\_low – 4\*fx\_high| | |fy\_high – 4\*fx\_low| |
| IMD frequency limits (MHz) | 1102 | 867 | 6477 | 6137 |
| Two-tone 5th order IMD products | |2\*fx\_low - 3\*fy\_high| | |2\*fx\_high - 3\*fy\_low| | |2\*fy\_low - 3\*fx\_high| | |2\*fy\_high -3\*fx\_low| |
| IMD frequency limits (MHz) | 1311 | 1581 | 4029 | 3724 |
| Two-tone 5th order IMD products | |fx\_low + 4\*fy\_low| | |fx\_high + 4\*fy\_high| | |fy\_low + 4\*fx\_low| | |fy\_high + 4\*fx\_high| |
| IMD frequency limits (MHz) | 4362 | 4597 | 7503 | 7843 |
| Two-tone 5th order IMD products | |2\*fx\_low + 3\*fy\_low| | |2\*fx\_high + 3\*fy\_high| | |2\*fy\_low + 3\*fx\_low| | |2\*fy\_high + 3\*fx\_high| |
| IMD frequency limits (MHz) | 5409 | 5679 | 6456 | 6761 |

The analysis shows there is no IMD issues of this uplink combination.

A study of the uplink combination affecting the downlink of the third band is shown in Table 5.58.3-2 for DC\_7A\_n105A into band 3 downlink.

Table 5.58.3-2: IMD analysis for DC\_7A\_n105A

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **UE UL carriers** | **fx\_low** | **fx\_high** | **fy\_low** | **fy\_high** |
| UL Frequency [MHz] | 2500 | 2570 | 663 | 703 |
| DL Frequency [MHz] | 2620 | 2690 | 612 | 652 |
| 2nd order IMD products | |fy\_low – fx\_high| | |fy\_high – fx\_low| | |fy\_low + fx\_low| | |fy\_high + fx\_high| |
| IMD frequency limits (MHz) | 1907 | 1797 | 3163 | 3273 |
| 3rd order IMD products | |2\*fx\_low – fy\_high| | |2\*fx\_high – fy\_low| | |2\*fy\_low – fx\_high| | |2\*fy\_high – fx\_low| |
| IMD frequency limits (MHz) | 4297 | 4477 | 1244 | 1094 |
| 3rd order IMD products | |2\*fx\_low + fy\_low| | |2\*fx\_high + fy\_high| | |2\*fy\_low + fx\_low| | |2\*fy\_high + fx\_high| |
| IMD frequency limits (MHz) | 5663 | 5843 | 3826 | 3976 |
| Two-tone 4th order IMD products | |3\*fx\_low –1\* fy\_high| | |3\*fx\_high – 1\*fy\_low| | |3\*fy\_low – 1\*fx\_high| | |3\*fy\_high – 1\*fx\_low| |
| IMD frequency limits (MHz) | 6797 | 7047 | 581 | 391 |
| Two-tone 4th order IMD products | |2\*fx\_low –2\* fy\_high| | |2\*fx\_high –2\* fy\_low| | |2\*fx\_low +2\* fy\_low| | |2\*fx\_high +2\* fy\_high| |
| IMD frequency limits (MHz) | 3594 | 3814 | 6326 | 6546 |
| Two-tone 4th order IMD products | |3\*fx\_low +1\* fy\_low| | |3\*fx\_high + 1\*fy\_high| | |3\*fy\_low + 1\*fx\_low| | |3\*fy\_high + 1\*fx\_high| |
| IMD frequency limits (MHz) | 8163 | 8413 | 4489 | 4679 |
| Two-tone 5th order IMD products | |fx\_low – 4\*fy\_high| | |fx\_high – 4\*fy\_low| | |fy\_low – 4\*fx\_high| | |fy\_high – 4\*fx\_low| |
| IMD frequency limits (MHz) | 312 | 82 | 9617 | 9297 |
| Two-tone 5th order IMD products | |2\*fx\_low - 3\*fy\_high| | |2\*fx\_high - 3\*fy\_low| | |2\*fy\_low - 3\*fx\_high| | |2\*fy\_high -3\*fx\_low| |
| IMD frequency limits (MHz) | 2891 | 3151 | 6384 | 6094 |
| Two-tone 5th order IMD products | |fx\_low + 4\*fy\_low| | |fx\_high + 4\*fy\_high| | |fy\_low + 4\*fx\_low| | |fy\_high + 4\*fx\_high| |
| IMD frequency limits (MHz) | 5152 | 5382 | 10663 | 10983 |
| Two-tone 5th order IMD products | |2\*fx\_low + 3\*fy\_low| | |2\*fx\_high + 3\*fy\_high| | |2\*fy\_low + 3\*fx\_low| | |2\*fy\_high + 3\*fx\_high| |
| IMD frequency limits (MHz) | 6989 | 7249 | 8826 | 9116 |

Based on Table 5.58.3-1 and Table 5.58.3-2:

* The 2nd order IMD product of DC\_7\_n105 falls inside band 3 downlink

5.58.4 ∆TIB and ∆RIB values

For DC\_3-7\_n105, the ΔTIB,c and ΔRIB,c values are taken from fallbacks.

**Table 5.58.4-1:ΔTIB,c due to EN-DC (three bands)**

| Inter-band EN-DC configuration | ΔTIB,c for E-UTRA band / NR band (dB)6 | | |
| --- | --- | --- | --- |
| Component band in order of bands in configuration7 | | |
| DC\_3-7\_n105 | 0.5 | 0.5 | 0.6 |
| NOTE 6: “-” denotes ΔTIB,c = 0.  NOTE 7: The component band order in the configuration should be listed by the order of E-UTRA band and NR band respectively, such as for DC\_66\_(n)12 the band order from left to right is 12, 66 and n12. | | | |

**Table 5.58.4-2:ΔRIB,c due to EN-DC (three bands)**

| **Inter-band EN-DC configuration** | ΔRIB,c for E-UTRA band / NR band (dB)7 | | |
| --- | --- | --- | --- |
| Component band in order of bands in configuration8 | | |
| DC\_3-7\_n105 | - | - | 0.3 |
| NOTE 7: “-” denotes ΔRIB,c = 0.  NOTE 8: The component band order in the configuration should be listed by the order of E-UTRA band and NR band respectively, such as for DC\_5\_(n)12 the band order from left to right is 5, 12 and n12. | | | |

5.58.5 REFSENS requirements

MSD values are reused from CA\_n3-n7-n28. The test frequencies are not re-used.

Table 5.58.5-1: 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-7A\_n105A | 3 | 1780 | 5 | 25 | 1875 | 16.5 | IMD2 |
|  | 7 | 2550 | 5 | 25 | 2670 | N/A | N/A |
|  | n105 | 675 | 5 | 25 | 624 | N/A | N/A |

## 5.59 DC\_8-39\_n40

### 5.59.1 Configurations for DC

Table 5.59.1-1: Inter-band DC configurations (three bands)

| **EN-DC**  **configuration** | **Uplink EN-DC**  **configuration** |
| --- | --- |
| DC\_8A-39A\_n40A | DC\_8A\_n40A  DC\_39A\_n40A |

### 5.59.2 Co-existence studies

Co-existence analysis for DC\_39\_n40 UL in TR 37.716-11-11 shows IMD4 and IMD5 produce impact to NR Band 8 DL.

Co-existence analysis for DC\_8\_n40 UL in TR 37.863-01-01 shows IMD5 produce impact to NR Band n39 DL.

### 5.59.3 ∆TIB and ∆RIB values

For DC\_8-39\_n40, the ΔTIB,c and ΔRIB,c values are reused from DC\_8\_n39-n40 and given in the tables below.

**Table 5.59.3-1:ΔTIB,c due to EN-DC (three bands)**

| Inter-band EN-DC configuration | ΔTIB,c for E-UTRA band / NR band (dB)6 | | |
| --- | --- | --- | --- |
| Component band in order of bands in configuration7 | | |
| DC\_8-39\_n40 | 0.3 | 0.3 | 0.3 |
| NOTE 6: “-” denotes ΔTIB,c = 0.  NOTE 7: The component band order in the configuration should be listed by the order of E-UTRA band and NR band respectively, such as for DC\_66\_(n)12 the band order from left to right is 12, 66 and n12. | | | |

**Table 5.59.3-2:ΔRIB,c due to EN-DC (three bands)**

| **Inter-band EN-DC configuration** | ΔRIB,c for E-UTRA band / NR band (dB)7 | | |
| --- | --- | --- | --- |
| Component band in order of bands in configuration8 | | |
| DC\_8-39\_n40 | - | - | - |
| NOTE 7: “-” denotes ΔRIB,c = 0.  NOTE 8: The component band order in the configuration should be listed by the order of E-UTRA band and NR band respectively, such as for DC\_5\_(n)12 the band order from left to right is 5, 12 and n12. | | | |

### 5.59.4 Reference sensitivity exceptions

Based on co-existence studies, there is IMD5 products cause by DC\_8\_n40 will falls into band 39. However, simultaneous Rx/Tx is not supported for DC\_39\_n40, which means synchronization between band 39 and n40. Therefore no additional MSD is needed to be defined

For the IMD4 and IMD5 MSD caused by DC\_39\_n40 fall into B8, the MSD values are proposed as follow:

Table 5.59.4-1: 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\_8A-39A\_n40A | 8 | 895 | 5 | 25 | 940 | 8.6 | IMD4 |
|  | 39 | 1900 | 5 | 25 | 1900 | N/A | N/A |
|  | n40 | 2370 | 5 | 25 | 2370 | N/A | N/A |
|  | 8 | 885 | 5 | 25 | 930 | 4.9 | IMD5 |
|  | 39 | 1890 | 5 | 25 | 1890 | N/A | N/A |
|  | n40 | 2370 | 5 | 25 | 2370 | N/A | N/A |

## 5.60 DC\_66-71\_n2

### 5.60.1 Configurations for DC

Table 5.60.1-1: Inter-band DC configurations (three bands)

| **EN-DC**  **configuration** | **Uplink EN-DC**  **configuration** |
| --- | --- |
| DC\_66A-71A\_n2(2A) | DC\_66A\_n2A DC\_71A\_n2A |

### 5.60.2 Co-existence studies

Table 5.60.2-1 lists the UL configuration of DC\_66\_n2 2nd to 5th order harmonics and 2nd, 3rd, 4th and 5th order IMD for the UE-to-UE coexistence analysis.

Table 5.60.2-1: UL DC\_66\_n2 harmonics and IMD products

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **UE UL carriers** | **fx\_low** | **fx\_high** | **fy\_low** | **fy\_high** |
| UL frequency (MHz) | 1850 | 1910 | 1710 | 1780 |
| 2nd harmonics frequency limits | 2\*fx\_low | 2\*fx\_high | 2\* fy\_low | 2\* fy\_high |
| 2nd harmonics frequency limits (MHz) | 3700 | 3820 | 3420 | 3560 |
| 3rd harmonics frequency limits | 3\*fx\_low | 3\*fx\_high | 3\* fy\_low | 3\* fy\_high |
| 3rd harmonics frequency limits (MHz) | 5550 | 5730 | 5130 | 5340 |
| 4th harmonics frequency limits | 4\*fx\_low | 4\*fx\_high | 4\* fy\_low | 4\* fy\_high |
| 4th harmonics frequency limits (MHz) | 7400 | 7640 | 6840 | 7120 |
| 5th harmonics frequency limits | 5\*fx\_low | 5\*fx\_high | 5\* fy\_low | 5\* fy\_high |
| 5th harmonics frequency limits (MHz) | 9250 | 9550 | 8550 | 8900 |
| 2nd order IMD products | |fy\_low – fx\_high| | |fy\_high – fx\_low| | |fy\_low + fx\_low| | |fy\_high + fx\_high| |
| IMD frequency limits (MHz) | 200 | 70 | 3560 | 3690 |
| Two-tone 3rd order IMD products | |2\*fx\_low – fy\_high| | |2\*fx\_high – fy\_low| | |2\*fy\_low – fx\_high| | |2\*fy\_high – fx\_low| |
| IMD frequency limits (MHz) | 1920 | 2110 | 1510 | 1710 |
| Two-tone 3rd order IMD products | |2\*fx\_low + fy\_low| | |2\*fx\_high + fy\_high| | |2\*fy\_low + fx\_low| | |2\*fy\_high + fx\_high| |
| IMD frequency limits (MHz) | 5410 | 5600 | 5270 | 5470 |
| Two-tone 4th order IMD products | |3\*fx\_low –1\* fy\_high| | |3\*fx\_high – 1\*fy\_low| | |3\*fy\_low – 1\*fx\_high| | |3\*fy\_high – 1\*fx\_low| |
| IMD frequency limits (MHz) | 3770 | 4020 | 3220 | 3490 |
| Two-tone 4th order IMD products | |3\*fx\_low +1\* fy\_low| | |3\*fx\_high + 1\*fy\_high| | |3\*fy\_low + 1\*fx\_low| | |3\*fy\_high + 1\*fx\_high| |
| IMD frequency limits (MHz) | 7260 | 7510 | 6980 | 7250 |
| Two-tone 4th order IMD products | |2\*fx\_low –2\* fy\_high| | |2\*fx\_high –2\* fy\_low| | |2\*fx\_low +2\* fy\_low| | |2\*fx\_high +2\* fy\_high| |
| IMD frequency limits (MHz) | 140 | 400 | 7120 | 7380 |
| Two-tone 5th order IMD products | |fx\_low – 4\*fy\_high| | |fx\_high – 4\*fy\_low| | |fy\_low – 4\*fx\_high| | |fy\_high – 4\*fx\_low| |
| IMD frequency limits (MHz) | 5270 | 4930 | 5930 | 5620 |
| Two-tone 5th order IMD products | |2\*fx\_low - 3\*fy\_high| | |2\*fx\_high - 3\*fy\_low| | |2\*fy\_low - 3\*fx\_high| | |2\*fy\_high -3\*fx\_low| |
| IMD frequency limits (MHz) | 1640 | 1310 | 2310 | 1990 |
| Two-tone 5th order IMD products | |fx\_low + 4\*fy\_low| | |fx\_high + 4\*fy\_high| | |fy\_low + 4\*fx\_low| | |fy\_high + 4\*fx\_high| |
| IMD frequency limits (MHz) | 8690 | 9030 | 9110 | 9420 |
| Two-tone 5th order IMD products | |2\*fx\_low + 3\*fy\_low| | |2\*fx\_high + 3\*fy\_high| | |2\*fy\_low + 3\*fx\_low| | |2\*fy\_high + 3\*fx\_high| |
| IMD frequency limits (MHz) | 8830 | 9160 | 8970 | 9290 |

Based on Table 5.60.2-1, the IMD3 from UL DC\_66\_n2 may affect DL band 2.

The IMD5 from UL DC\_66\_n2 may affect DL band 66.

Table 5.60.2-2 lists the UL configuration of DC\_71A\_n2A 2nd to 5th order harmonics and 2nd, 3rd, 4th and 5th order IMD for the UE-to-UE coexistence analysis.

Table 5.60.2-2: DC\_71A\_n2A UL harmonics and IMD products

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **UE UL carriers** | **fx\_low** | **fx\_high** | **fy\_low** | **fy\_high** |
| UL frequency (MHz) | 1850 | 1910 | 663 | 698 |
| 2nd harmonics frequency limits | 2\*fx\_low | 2\*fx\_high | 2\* fy\_low | 2\* fy\_high |
| 2nd harmonics frequency limits (MHz) | 3700 | 3820 | 1326 | 1396 |
| 3rd harmonics frequency limits | 3\*fx\_low | 3\*fx\_high | 3\* fy\_low | 3\* fy\_high |
| 3rd harmonics frequency limits (MHz) | 5550 | 5730 | 1989 | 2094 |
| 4th harmonics frequency limits | 4\*fx\_low | 4\*fx\_high | 4\* fy\_low | 4\* fy\_high |
| 4th harmonics frequency limits (MHz) | 7400 | 7640 | 2652 | 2792 |
| 5th harmonics frequency limits | 5\*fx\_low | 5\*fx\_high | 5\* fy\_low | 5\* fy\_high |
| 5th harmonics frequency limits (MHz) | 9250 | 9550 | 3315 | 3490 |
| 2nd order IMD products | |fy\_low – fx\_high| | |fy\_high – fx\_low| | |fy\_low + fx\_low| | |fy\_high + fx\_high| |
| IMD frequency limits (MHz) | 1247 | 1152 | 2513 | 2608 |
| Two-tone 3rd order IMD products | |2\*fx\_low – fy\_high| | |2\*fx\_high – fy\_low| | |2\*fy\_low – fx\_high| | |2\*fy\_high – fx\_low| |
| IMD frequency limits (MHz) | 3002 | 3157 | 584 | 454 |
| Two-tone 3rd order IMD products | |2\*fx\_low + fy\_low| | |2\*fx\_high + fy\_high| | |2\*fy\_low + fx\_low| | |2\*fy\_high + fx\_high| |
| IMD frequency limits (MHz) | 4363 | 4518 | 3176 | 3306 |
| Two-tone 4th order IMD products | |3\*fx\_low –1\* fy\_high| | |3\*fx\_high – 1\*fy\_low| | |3\*fy\_low – 1\*fx\_high| | |3\*fy\_high – 1\*fx\_low| |
| IMD frequency limits (MHz) | 4852 | 5067 | 79 | 244 |
| Two-tone 4th order IMD products | |3\*fx\_low +1\* fy\_low| | |3\*fx\_high + 1\*fy\_high| | |3\*fy\_low + 1\*fx\_low| | |3\*fy\_high + 1\*fx\_high| |
| IMD frequency limits (MHz) | 6213 | 6428 | 3839 | 4004 |
| Two-tone 4th order IMD products | |2\*fx\_low –2\* fy\_high| | |2\*fx\_high –2\* fy\_low| | |2\*fx\_low +2\* fy\_low| | |2\*fx\_high +2\* fy\_high| |
| IMD frequency limits (MHz) | 2304 | 2494 | 5026 | 5216 |
| Two-tone 5th order IMD products | |fx\_low – 4\*fy\_high| | |fx\_high – 4\*fy\_low| | |fy\_low – 4\*fx\_high| | |fy\_high – 4\*fx\_low| |
| IMD frequency limits (MHz) | 942 | 742 | 6977 | 6702 |
| Two-tone 5th order IMD products | |2\*fx\_low - 3\*fy\_high| | |2\*fx\_high - 3\*fy\_low| | |2\*fy\_low - 3\*fx\_high| | |2\*fy\_high -3\*fx\_low| |
| IMD frequency limits (MHz) | 1606 | 1831 | 4404 | 4154 |
| Two-tone 5th order IMD products | |fx\_low + 4\*fy\_low| | |fx\_high + 4\*fy\_high| | |fy\_low + 4\*fx\_low| | |fy\_high + 4\*fx\_high| |
| IMD frequency limits (MHz) | 4502 | 4702 | 8063 | 8338 |
| Two-tone 5th order IMD products | |2\*fx\_low + 3\*fy\_low| | |2\*fx\_high + 3\*fy\_high| | |2\*fy\_low + 3\*fx\_low| | |2\*fy\_high + 3\*fx\_high| |
| IMD frequency limits (MHz) | 5689 | 5914 | 6876 | 7126 |

Based on Table 5.60.2-1, there is no harmonic or IMD impact from UL 71\_n2 affecting DL band 71, 2 and n66.

### 5.60.3 ∆TIB and ∆RIB values

For DC\_66-71\_n2, the ΔTIB,c and ΔRIB,c values are reused from CA\_n2-n66-n71 and are given in the tables below.

**Table 5.60.3-1:ΔTIB,c due to EN-DC (three bands)**

| Inter-band EN-DC configuration | ΔTIB,c for E-UTRA band / NR band (dB)6 | | |
| --- | --- | --- | --- |
| Component band in order of bands in configuration7 | | |
| DC\_66-71\_n2 | 0.5 | 0.3 | 0.5 |
| NOTE 6: “-” denotes ΔTIB,c = 0.  NOTE 7: The component band order in the configuration should be listed by the order of E-UTRA band and NR band respectively, such as for DC\_66\_(n)12 the band order from left to right is 12, 66 and n12. | | | |

**Table 5.60.3-2:ΔRIB,c due to EN-DC (three bands)**

| **Inter-band EN-DC configuration** | ΔRIB,c for E-UTRA band / NR band (dB)7 | | |
| --- | --- | --- | --- |
| Component band in order of bands in configuration8 | | |
| DC\_66-71\_n2 | 0.3 | - | 0.3 |
| NOTE 7: “-” denotes ΔRIB,c = 0.  NOTE 8: The component band order in the configuration should be listed by the order of E-UTRA band and NR band respectively, such as for DC\_5\_(n)12 the band order from left to right is 5, 12 and n12. | | | |

### 5.60.4 Reference sensitivity exceptions

Compared to its fallback modes, no additional MSD requirements for this band combination are needed.

## 5.61 DC\_8-39\_n41

### 5.61.1 Configurations for DC

Table 5.61.1-1: Inter-band DC configurations (three bands)

| **EN-DC**  **configuration** | **Uplink EN-DC**  **configuration** |
| --- | --- |
| DC\_8A-39A\_n41A  DC\_8A-39A\_n41C | DC\_8A\_n41A DC\_39A\_n41A |

### 5.61.2 Co-existence studies

In terms of the co-existence studies of the fallbacks of DC\_8\_n41 and DC\_39\_n41, which are captured in the TR 37.863-01-01, it can be found that:

* No IMD products produced by Band 8 and Band n41 that impact the reference sensitivity of LTE band 39.
* No IMD products produced by Band 39 and Band n41 that impact the reference sensitivity of LTE band 8.

### 5.61.3 ∆TIB and ∆RIB values

For DC\_8-39\_n41, the ΔTIB,c and ΔRIB,c values are reused from DC\_8\_n39-n41 and given in the tables below.

**Table 5.61.3-1:ΔTIB,c due to EN-DC (three bands)**

| Inter-band EN-DC configuration | ΔTIB,c for E-UTRA band / NR band (dB)6 | | |
| --- | --- | --- | --- |
| Component band in order of bands in configuration7 | | |
| DC\_8-39\_n41 | 0.3 | 0.3 | 0.3 |
| NOTE 6: “-” denotes ΔTIB,c = 0.  NOTE 7: The component band order in the configuration should be listed by the order of E-UTRA band and NR band respectively, such as for DC\_66\_(n)12 the band order from left to right is 12, 66 and n12. | | | |

**Table 5.61.3-2:ΔRIB,c due to EN-DC (three bands)**

| **Inter-band EN-DC configuration** | ΔRIB,c for E-UTRA band / NR band (dB)7 | | |
| --- | --- | --- | --- |
| Component band in order of bands in configuration8 | | |
| DC\_8-39\_n41 | - | - | - |
| NOTE 7: “-” denotes ΔRIB,c = 0.  NOTE 8: The component band order in the configuration should be listed by the order of E-UTRA band and NR band respectively, such as for DC\_5\_(n)12 the band order from left to right is 5, 12 and n12. | | | |

### 5.61.4 Reference sensitivity exceptions

According to the co-existence study, no MSD issues need to be specified. Therefore, no additional REFENS requirements need to be specified.

## 5.62 DC\_7-66\_n2

### 5.62.1 Configurations for DC

Table 5.62.1-1: Inter-band DC configurations (three bands)

| **EN-DC**  **configuration** | **Uplink EN-DC**  **configuration** |
| --- | --- |
| DC\_7A-66A\_n2(2A) | DC\_7A\_n2A  DC\_66A\_n2A |

### 5.62.2 Co-existence studies

Table 5.62.2-1 lists the UL configuration of DC\_7\_n2 2nd to 5th order harmonics and 2nd, 3rd, 4th and 5th order IMD for the UE-to-UE coexistence analysis.

Table 5.62.2-1: UL DC\_7\_n2 harmonics and IMD products

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **UE UL carriers** | **fx\_low** | **fx\_high** | **fy\_low** | **fy\_high** |
| UL frequency (MHz) | 1850 | 1910 | 2500 | 2570 |
| 2nd harmonics frequency limits | 2\*fx\_low | 2\*fx\_high | 2\* fy\_low | 2\* fy\_high |
| 2nd harmonics frequency limits (MHz) | 3700 | 3820 | 5000 | 5140 |
| 3rd harmonics frequency limits | 3\*fx\_low | 3\*fx\_high | 3\* fy\_low | 3\* fy\_high |
| 3rd harmonics frequency limits (MHz) | 5550 | 5730 | 7500 | 7710 |
| 4th harmonics frequency limits | 4\*fx\_low | 4\*fx\_high | 4\* fy\_low | 4\* fy\_high |
| 4th harmonics frequency limits (MHz) | 7400 | 7640 | 10000 | 10280 |
| 5th harmonics frequency limits | 5\*fx\_low | 5\*fx\_high | 5\* fy\_low | 5\* fy\_high |
| 5th harmonics frequency limits (MHz) | 9250 | 9550 | 12500 | 12850 |
| 2nd order IMD products | |fy\_low – fx\_high| | |fy\_high – fx\_low| | |fy\_low + fx\_low| | |fy\_high + fx\_high| |
| IMD frequency limits (MHz) | 590 | 720 | 4350 | 4480 |
| Two-tone 3rd order IMD products | |2\*fx\_low – fy\_high| | |2\*fx\_high – fy\_low| | |2\*fy\_low – fx\_high| | |2\*fy\_high – fx\_low| |
| IMD frequency limits (MHz) | 1130 | 1320 | 3090 | 3290 |
| Two-tone 3rd order IMD products | |2\*fx\_low + fy\_low| | |2\*fx\_high + fy\_high| | |2\*fy\_low + fx\_low| | |2\*fy\_high + fx\_high| |
| IMD frequency limits (MHz) | 6200 | 6390 | 6850 | 7050 |
| Two-tone 4th order IMD products | |3\*fx\_low –1\* fy\_high| | |3\*fx\_high – 1\*fy\_low| | |3\*fy\_low – 1\*fx\_high| | |3\*fy\_high – 1\*fx\_low| |
| IMD frequency limits (MHz) | 2980 | 3230 | 5590 | 5860 |
| Two-tone 4th order IMD products | |3\*fx\_low +1\* fy\_low| | |3\*fx\_high + 1\*fy\_high| | |3\*fy\_low + 1\*fx\_low| | |3\*fy\_high + 1\*fx\_high| |
| IMD frequency limits (MHz) | 8050 | 8300 | 9350 | 9620 |
| Two-tone 4th order IMD products | |2\*fx\_low –2\* fy\_high| | |2\*fx\_high –2\* fy\_low| | |2\*fx\_low +2\* fy\_low| | |2\*fx\_high +2\* fy\_high| |
| IMD frequency limits (MHz) | 1440 | 1180 | 8700 | 8960 |
| Two-tone 5th order IMD products | |fx\_low – 4\*fy\_high| | |fx\_high – 4\*fy\_low| | |fy\_low – 4\*fx\_high| | |fy\_high – 4\*fx\_low| |
| IMD frequency limits (MHz) | 8430 | 8090 | 5140 | 4830 |
| Two-tone 5th order IMD products | |2\*fx\_low - 3\*fy\_high| | |2\*fx\_high - 3\*fy\_low| | |2\*fy\_low - 3\*fx\_high| | |2\*fy\_high -3\*fx\_low| |
| IMD frequency limits (MHz) | 4010 | 3680 | 730 | 410 |
| Two-tone 5th order IMD products | |fx\_low + 4\*fy\_low| | |fx\_high + 4\*fy\_high| | |fy\_low + 4\*fx\_low| | |fy\_high + 4\*fx\_high| |
| IMD frequency limits (MHz) | 11850 | 12190 | 9900 | 10210 |
| Two-tone 5th order IMD products | |2\*fx\_low + 3\*fy\_low| | |2\*fx\_high + 3\*fy\_high| | |2\*fy\_low + 3\*fx\_low| | |2\*fy\_high + 3\*fx\_high| |
| IMD frequency limits (MHz) | 11200 | 11530 | 10550 | 10870 |

There is no harmonic or IMD impact from UL DC\_7\_n2 affecting DL band n2, 7 and 66.

Table 5.62.2-2 lists the UL configuration of DC\_5\_n41 2nd to 5th order harmonics and 2nd, 3rd, 4th and 5th order IMD for the UE-to-UE coexistence analysis.

Table 5.62.2-2: DC\_66\_n2 UL harmonics and IMD products

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **UE UL carriers** | **fx\_low** | **fx\_high** | **fy\_low** | **fy\_high** |
| UL frequency (MHz) | 1850 | 1910 | 1710 | 1780 |
| 2nd harmonics frequency limits | 2\*fx\_low | 2\*fx\_high | 2\* fy\_low | 2\* fy\_high |
| 2nd harmonics frequency limits (MHz) | 3700 | 3820 | 3420 | 3560 |
| 3rd harmonics frequency limits | 3\*fx\_low | 3\*fx\_high | 3\* fy\_low | 3\* fy\_high |
| 3rd harmonics frequency limits (MHz) | 5550 | 5730 | 5130 | 5340 |
| 4th harmonics frequency limits | 4\*fx\_low | 4\*fx\_high | 4\* fy\_low | 4\* fy\_high |
| 4th harmonics frequency limits (MHz) | 7400 | 7640 | 6840 | 7120 |
| 5th harmonics frequency limits | 5\*fx\_low | 5\*fx\_high | 5\* fy\_low | 5\* fy\_high |
| 5th harmonics frequency limits (MHz) | 9250 | 9550 | 8550 | 8900 |
| 2nd order IMD products | |fy\_low – fx\_high| | |fy\_high – fx\_low| | |fy\_low + fx\_low| | |fy\_high + fx\_high| |
| IMD frequency limits (MHz) | 200 | 70 | 3560 | 3690 |
| Two-tone 3rd order IMD products | |2\*fx\_low – fy\_high| | |2\*fx\_high – fy\_low| | |2\*fy\_low – fx\_high| | |2\*fy\_high – fx\_low| |
| IMD frequency limits (MHz) | 1920 | 2110 | 1510 | 1710 |
| Two-tone 3rd order IMD products | |2\*fx\_low + fy\_low| | |2\*fx\_high + fy\_high| | |2\*fy\_low + fx\_low| | |2\*fy\_high + fx\_high| |
| IMD frequency limits (MHz) | 5410 | 5600 | 5270 | 5470 |
| Two-tone 4th order IMD products | |3\*fx\_low –1\* fy\_high| | |3\*fx\_high – 1\*fy\_low| | |3\*fy\_low – 1\*fx\_high| | |3\*fy\_high – 1\*fx\_low| |
| IMD frequency limits (MHz) | 3770 | 4020 | 3220 | 3490 |
| Two-tone 4th order IMD products | |3\*fx\_low +1\* fy\_low| | |3\*fx\_high + 1\*fy\_high| | |3\*fy\_low + 1\*fx\_low| | |3\*fy\_high + 1\*fx\_high| |
| IMD frequency limits (MHz) | 7260 | 7510 | 6980 | 7250 |
| Two-tone 4th order IMD products | |2\*fx\_low –2\* fy\_high| | |2\*fx\_high –2\* fy\_low| | |2\*fx\_low +2\* fy\_low| | |2\*fx\_high +2\* fy\_high| |
| IMD frequency limits (MHz) | 140 | 400 | 7120 | 7380 |
| Two-tone 5th order IMD products | |fx\_low – 4\*fy\_high| | |fx\_high – 4\*fy\_low| | |fy\_low – 4\*fx\_high| | |fy\_high – 4\*fx\_low| |
| IMD frequency limits (MHz) | 5270 | 4930 | 5930 | 5620 |
| Two-tone 5th order IMD products | |2\*fx\_low - 3\*fy\_high| | |2\*fx\_high - 3\*fy\_low| | |2\*fy\_low - 3\*fx\_high| | |2\*fy\_high -3\*fx\_low| |
| IMD frequency limits (MHz) | 1640 | 1310 | 2310 | 1990 |
| Two-tone 5th order IMD products | |fx\_low + 4\*fy\_low| | |fx\_high + 4\*fy\_high| | |fy\_low + 4\*fx\_low| | |fy\_high + 4\*fx\_high| |
| IMD frequency limits (MHz) | 8690 | 9030 | 9110 | 9420 |
| Two-tone 5th order IMD products | |2\*fx\_low + 3\*fy\_low| | |2\*fx\_high + 3\*fy\_high| | |2\*fy\_low + 3\*fx\_low| | |2\*fy\_high + 3\*fx\_high| |
| IMD frequency limits (MHz) | 8830 | 9160 | 8970 | 9290 |

The IMD3 from UL\_66\_n2 may affect DL band 2.

The IMD5 from UL\_66\_n2 may affect DL band 66.

There is no IMD impact from UL\_66\_n2 affecting DL band 7.

### 5.62.3 ∆TIB and ∆RIB values

For DC\_7-66\_n2, the ΔTIB,c and ΔRIB,c values are reused from CA\_2-7-66 and are given in the tables below.

**Table 5.62.3-1:ΔTIB,c due to EN-DC (three bands)**

| Inter-band EN-DC configuration | ΔTIB,c for E-UTRA band / NR band (dB)6 | | |
| --- | --- | --- | --- |
| Component band in order of bands in configuration7 | | |
| DC\_7-66\_n2 | 0.5 | 0.5 | 0.5 |
| NOTE 6: “-” denotes ΔTIB,c = 0.  NOTE 7: The component band order in the configuration should be listed by the order of E-UTRA band and NR band respectively, such as for DC\_66\_(n)12 the band order from left to right is 12, 66 and n12. | | | |

**Table 5.62.3-2:ΔRIB,c due to EN-DC (three bands)**

| **Inter-band EN-DC configuration** | ΔRIB,c for E-UTRA band / NR band (dB)7 | | |
| --- | --- | --- | --- |
| Component band in order of bands in configuration8 | | |
| DC\_7-66\_n2 | 0.5 | 0.5 | 0.3 |
| NOTE 7: “-” denotes ΔRIB,c = 0.  NOTE 8: The component band order in the configuration should be listed by the order of E-UTRA band and NR band respectively, such as for DC\_5\_(n)12 the band order from left to right is 5, 12 and n12. | | | |

### 5.62.4 Reference sensitivity exceptions

Compared to its fallback modes, no additional MSD requirements for this band combination are needed.

## 5.63 DC\_3-40\_n77

5.63.1 Configurations for DC

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

| **EN-DC**  **configuration** | **Uplink EN-DC**  **configuration** |
| --- | --- |
| DC\_3A-40A\_n77A  DC\_3A-40C\_n77A | DC\_3A\_n77A  DC\_40A\_n77A |

5.63.2 Co-existence studies

Based on co-existence studies of DC\_3\_n77 and DC\_40\_n77, own Rx impact of the 3rd band is the followings.

- 2nd and 5th order IMD products generated by DC\_3\_n77 uplink may fall into own Rx of band 40.

- 2nd and 4th order IMD products generated by DC\_40\_n77 uplink may fall into own Rx of band 3.

5.63.3 ∆TIB and ∆RIB values

For DC\_3-40\_n77, the ΔTIB,c and ΔRIB,c values are reused from DC\_3\_n40-n77 are given in the tables below.

**Table 5.63.3-1: ΔTIB,c**

| **Inter-band EN-DC configuration** | **ΔTIB,c for E-UTRA band / NR band (dB)6** | | |
| --- | --- | --- | --- |
| **Component band in order of bands in configuration7** | | |
| DC\_3-40\_n77 | 0.6 | 0.5 | 0.8 |
| NOTE 6: “-” denotes ΔTIB,c = 0.  NOTE 7: The component band order in the configuration should be listed by the order of E-UTRA band and NR band respectively, such as for DC\_66\_(n)12 the band order from left to right is 12, 66 and n12. | | | |

**Table 5.63.3-2: ΔRIB**

| **Inter-band EN-DC configuration** | **ΔRIB,c for E-UTRA band / NR band (dB)7** | | |
| --- | --- | --- | --- |
| **Component band in order of bands in configuration8** | | |
| DC\_3-40\_n77 | 0.2 | - | 0.5 |
| NOTE 7: “-” denotes ΔRIB,c = 0.  NOTE 8: The component band order in the configuration should be listed by the order of E-UTRA band and NR band respectively, such as for DC\_5\_(n)12 the band order from left to right is 5, 12 and n12. | | | |

5.63.4 Reference sensitivity exceptions

Table 5.63.4-1 lists the MSD required for the dual connectivity configuration for the cases that IMD interference fall into the own 3rd Rx frequency band. The MSD values for CA\_n3A-n40A-n77A and CA\_n3-n41-n77 are reused.

**Table 5.63.4-1: MSD for the DC configuration**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **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-40A\_n77A  DC\_3A-40C\_n77A | 3 | 1720 | 5 | 25 | 1815 | N/A | N/A |
|  | 40 | 2310 | 5 | 25 | 2310 | 29.4 | IMD2 |
|  | n77 | 4030 | 10 | 50 | 4030 | N/A | N/A |
|  | 3 | 1720 | 5 | 25 | 1815 | N/A | N/A |
|  | 40 | 2350 | 5 | 25 | 2350 | 5.3 | IMD5 |
|  | n77 | 3755 | 10 | 50 | 3755 | N/A | N/A |
|  | 3 | 1725 | 5 | 25 | 1820 | 29.9 | IMD29 |
|  | 40 | 2310 | 5 | 25 | 2310 | N/A | N/A |
|  | n77 | 4130 | 10 | 50 | 4130 | N/A | N/A |
| NOTE 9: This band is subject to IMD4 also which MSD is not specified. | | | | | | | |

## 5.64 DC\_5-40\_n77

5.64.1 Configurations for DC

**Table 5.64.1-1: Inter-band DC configurations (three bands)**

| **EN-DC**  **configuration** | **Uplink EN-DC**  **configuration** |
| --- | --- |
| DC\_5A-40A\_n77A  DC\_5A-40C\_n77A  DC\_5A-40A\_n77C  DC\_5A-40C\_n77C | DC\_5A\_n77A  DC\_40A\_n77A |

5.64.2 Co-existence studies

Based on co-existence studies of DC\_5\_n77 and DC\_40\_n77, own Rx impact of the 3rd band is the followings.

- 3th order IMD products generated by DC\_5\_n77 uplink may fall into own Rx of band 40.

- 3th and 5th order IMD products generated by DC\_40\_n77 uplink may fall into own Rx of band 5.

5.64.3 ∆TIB and ∆RIB values

For DC\_5-40\_n77, the ΔTIB,c and ΔRIB,c values are reused from DC\_5\_n40-n77 are given in the tables below.

**Table 5.64.3-1: ΔTIB,c**

| **Inter-band EN-DC configuration** | **ΔTIB,c for E-UTRA band / NR band (dB)6** | | |
| --- | --- | --- | --- |
| **Component band in order of bands in configuration7** | | |
| DC\_5-40\_n77 | 0.6 | 0.3 | 0.8 |
| NOTE 6: “-” denotes ΔTIB,c = 0.  NOTE 7: The component band order in the configuration should be listed by the order of E-UTRA band and NR band respectively, such as for DC\_66\_(n)12 the band order from left to right is 12, 66 and n12. | | | |

**Table 5.64.3-2: ΔRIB**

| **Inter-band EN-DC configuration** | **ΔRIB,c for E-UTRA band / NR band (dB)7** | | |
| --- | --- | --- | --- |
| **Component band in order of bands in configuration8** | | |
| DC\_5-40\_n77 | 0.2 | - | 0.5 |
| NOTE 7: “-” denotes ΔRIB,c = 0.  NOTE 8: The component band order in the configuration should be listed by the order of E-UTRA band and NR band respectively, such as for DC\_5\_(n)12 the band order from left to right is 5, 12 and n12. | | | |

5.64.4 Reference sensitivity exceptions

Table 5.64.4-1 lists the MSD required for the dual connectivity configuration for the cases that IMD interference fall into the own 3rd Rx frequency band. The MSD values for CA\_n5-n40-n78 and DC\_5A\_n40A-n77A are reused.

**Table 5.64.4-1: MSD for the DC configuration**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **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\_5-40\_n77 | 5 | 835 | 5 | 25 | 880 | N/A | N/A |
|  | 40 | 2355 | 5 | 25 | 2355 | 13.2 | IMD3 |
|  | n77 | 4025 | 10 | 50 | 4025 | N/A | N/A |
|  | 5 | 835 | 5 | 25 | 880 | 15.2 | IMD34 |
|  | 40 | 2310 | 5 | 25 | 2310 | N/A | N/A |
|  | n77 | 3740 | 10 | 50 | 3740 | N/A | N/A |
| NOTE 4: This band is subject to IMD5 also which MSD is not specified. | | | | | | | |

## 5.65 DC\_5-40\_n78

5.65.1 Configurations for DC

**Table 5.65.1-1: Inter-band DC configurations (three bands)**

| **EN-DC**  **configuration** | **Uplink EN-DC**  **configuration** |
| --- | --- |
| DC\_5A-40A\_n78A  DC\_5A-40C\_n78A  DC\_5A-40A\_n78C  DC\_5A-40C\_n78C | DC\_5A\_n78A  DC\_40A\_n78A |

5.65.2 Co-existence studies

Based on co-existence studies of DC\_5\_n78 and DC\_40\_n78, own Rx impact of the 3rd band is the followings.

- No IMD products generated by DC\_5\_n78 uplink may fall into own Rx of band 40.

- 3th order IMD products generated by DC\_40\_n78 uplink may fall into own Rx of band 5.

5.65.3 ∆TIB and ∆RIB values

For DC\_5-40\_n78, the ΔTIB,c and ΔRIB,c values are reused from DC\_5\_n40-n78 are given in the tables below.

**Table 5.65.3-1: ΔTIB,c**

| **Inter-band EN-DC configuration** | **ΔTIB,c for E-UTRA band / NR band (dB)6** | | |
| --- | --- | --- | --- |
| **Component band in order of bands in configuration7** | | |
| DC\_5-40\_n78 | 0.6 | 0.5 | 0.8 |
| NOTE 6: “-” denotes ΔTIB,c = 0.  NOTE 7: The component band order in the configuration should be listed by the order of E-UTRA band and NR band respectively, such as for DC\_66\_(n)12 the band order from left to right is 12, 66 and n12. | | | |

**Table 5.65.3-2: ΔRIB**

| **Inter-band EN-DC configuration** | **ΔRIB,c for E-UTRA band / NR band (dB)7** | | |
| --- | --- | --- | --- |
| **Component band in order of bands in configuration8** | | |
| DC\_5-40\_n78 | 0.2 | 0.4 | 0.5 |
| NOTE 7: “-” denotes ΔRIB,c = 0.  NOTE 8: The component band order in the configuration should be listed by the order of E-UTRA band and NR band respectively, such as for DC\_5\_(n)12 the band order from left to right is 5, 12 and n12. | | | |

5.65.4 Reference sensitivity exceptions

Table 5.65.4-1 lists the MSD required for the dual connectivity configuration for the cases that IMD interference fall into the own 3rd Rx frequency band. The MSD values for CA\_n5-n40-n78 are reused.

**Table 5.65.4-1: MSD for the DC configuration**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **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\_5-40\_n78 | 5 | 835 | 5 | 25 | 880 | 15.2 | IMD3 |
|  | 40 | 2310 | 5 | 25 | 2310 | N/A | N/A |
|  | n78 | 3740 | 10 | 50 | 3740 | N/A | N/A |

## 5.66 DC\_2-5\_n41

### 5.66.1 Configurations for DC

Table 5.66.1-1: Inter-band DC configurations (three bands)

| **EN-DC**  **configuration** | **Uplink EN-DC**  **configuration** |
| --- | --- |
| DC\_2A-5A\_n41A | DC\_2A\_n41A  DC\_5A\_n41A |
| DC\_2A-2A-5A\_n41A | DC\_2A\_n41A  DC\_5A\_n41A |

### 5.66.2 Co-existence studies

Based on co-existence studies of DC\_2\_n41 and DC\_5\_n41, there is no own Rx impact of the 3rd band for this combination.

### 5.66.3 ∆TIB and ∆RIB values

For DC\_2-5\_n41, the ΔTIB,c and ΔRIB,c values are reused from CA\_n2-n5-n41 are given in the tables below.

Table 5.66.3-1: ΔTIB,c

| Inter-band EN-DC configuration | ΔTIB,c for E-UTRA band / NR band (dB)6 | | |
| --- | --- | --- | --- |
| Component band in order of bands in configuration7 | | |
| DC\_2-5\_n41  DC\_2-2-5\_n41 | 0.5 | 0.6 | 0.41 / 0.92 |
| NOTE 6: “-” denotes ΔTIB,c = 0.  NOTE 7: The component band order in the configuration should be listed by the order of E-UTRA band and NR band respectively, such as for DC\_66\_(n)12 the band order from left to right is 12, 66 and n12. | | | |

**Table 5.66.3-2: ΔRIB**

| **nter-band EN-DC configuration** | ΔRIB,c for E-UTRA band / NR band (dB)7 | | |
| --- | --- | --- | --- |
| Component band in order of bands in configuration8 | | |
| DC\_2-5\_n41  DC\_2-2-5\_n41 | - | 0.2 | - |
| NOTE 7: “-” denotes ΔRIB,c = 0.  NOTE 8: The component band order in the configuration should be listed by the order of E-UTRA band and NR band respectively, such as for DC\_5\_(n)12 the band order from left to right is 5, 12 and n12. | | | |

### 5.66.4 Reference sensitivity exceptions

Based on co-existence studies in section 5.66.2, the er is no need to define MSD requirements.

## 5.67 DC\_2-7\_n12

### 5.67.1 Configurations for DC

Table 5.67.1-1: Inter-band DC configurations (three bands)

| **EN-DC**  **configuration** | **Uplink EN-DC**  **configuration** |
| --- | --- |
| DC\_2A-7A\_n12A | DC\_2A\_n12A  DC\_7A\_n12A |
| DC\_2A-2A-7A\_n12A | DC\_2A\_n12A  DC\_7A\_n12A |

### 5.67.2 Co-existence studies

Table 5.67.2-1 lists the UL configuration of DC\_2A\_n12A 2nd to 5th order harmonics and 2nd, 3rd, 4th and 5th order IMD for the UE-to-UE coexistence analysis.

Table 5.67.2-1: UL DC\_2A\_n12A harmonics and IMD products

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **UE UL carriers** | **fx\_low** | **fx\_high** | **fy\_low** | **fy\_high** |
| UL frequency (MHz) | 1850 | 1910 | 699 | 716 |
| 2nd harmonics frequency limits | 2\*fx\_low | 2\*fx\_high | 2\* fy\_low | 2\* fy\_high |
| 2nd harmonics frequency limits (MHz) | 3700 | 3820 | 1398 | 1432 |
| 3rd harmonics frequency limits | 3\*fx\_low | 3\*fx\_high | 3\* fy\_low | 3\* fy\_high |
| 3rd harmonics frequency limits (MHz) | 5550 | 5730 | 2097 | 2148 |
| 4th harmonics frequency limits | 4\*fx\_low | 4\*fx\_high | 4\* fy\_low | 4\* fy\_high |
| 4th harmonics frequency limits (MHz) | 7400 | 7640 | 2796 | 2864 |
| 5th harmonics frequency limits | 5\*fx\_low | 5\*fx\_high | 5\* fy\_low | 5\* fy\_high |
| 5th harmonics frequency limits (MHz) | 9250 | 9550 | 3495 | 3580 |
| 2nd order IMD products | |fy\_low – fx\_high| | |fy\_high – fx\_low| | |fy\_low + fx\_low| | |fy\_high + fx\_high| |
| IMD frequency limits (MHz) | 1211 | 1134 | 2549 | 2626 |
| Two-tone 3rd order IMD products | |2\*fx\_low – fy\_high| | |2\*fx\_high – fy\_low| | |2\*fy\_low – fx\_high| | |2\*fy\_high – fx\_low| |
| IMD frequency limits (MHz) | 2984 | 3121 | 512 | 418 |
| Two-tone 3rd order IMD products | |2\*fx\_low + fy\_low| | |2\*fx\_high + fy\_high| | |2\*fy\_low + fx\_low| | |2\*fy\_high + fx\_high| |
| IMD frequency limits (MHz) | 4399 | 4536 | 3248 | 3342 |
| Two-tone 4th order IMD products | |3\*fx\_low –1\* fy\_high| | |3\*fx\_high – 1\*fy\_low| | |3\*fy\_low – 1\*fx\_high| | |3\*fy\_high – 1\*fx\_low| |
| IMD frequency limits (MHz) | 4834 | 5031 | 187 | 298 |
| Two-tone 4th order IMD products | |3\*fx\_low +1\* fy\_low| | |3\*fx\_high + 1\*fy\_high| | |3\*fy\_low + 1\*fx\_low| | |3\*fy\_high + 1\*fx\_high| |
| IMD frequency limits (MHz) | 6249 | 6446 | 3947 | 4058 |
| Two-tone 4th order IMD products | |2\*fx\_low –2\* fy\_high| | |2\*fx\_high –2\* fy\_low| | |2\*fx\_low +2\* fy\_low| | |2\*fx\_high +2\* fy\_high| |
| IMD frequency limits (MHz) | 2268 | 2422 | 5098 | 5252 |
| Two-tone 5th order IMD products | |fx\_low – 4\*fy\_high| | |fx\_high – 4\*fy\_low| | |fy\_low – 4\*fx\_high| | |fy\_high – 4\*fx\_low| |
| IMD frequency limits (MHz) | 1014 | 886 | 6941 | 6684 |
| Two-tone 5th order IMD products | |2\*fx\_low - 3\*fy\_high| | |2\*fx\_high - 3\*fy\_low| | |2\*fy\_low - 3\*fx\_high| | |2\*fy\_high -3\*fx\_low| |
| IMD frequency limits (MHz) | 1552 | 1723 | 4332 | 4118 |
| Two-tone 5th order IMD products | |fx\_low + 4\*fy\_low| | |fx\_high + 4\*fy\_high| | |fy\_low + 4\*fx\_low| | |fy\_high + 4\*fx\_high| |
| IMD frequency limits (MHz) | 4646 | 4774 | 8099 | 8356 |
| Two-tone 5th order IMD products | |2\*fx\_low + 3\*fy\_low| | |2\*fx\_high + 3\*fy\_high| | |2\*fy\_low + 3\*fx\_low| | |2\*fy\_high + 3\*fx\_high| |
| IMD frequency limits (MHz) | 5797 | 5968 | 6948 | 7162 |

Based on Table 5.67.2-1, the IMD2 from UL 2\_n12, that is, 1\*fx +1\*fy, may affect DL band 7.

Table 5.67.2-2 lists the UL configuration of DC\_7A\_n12A 2nd to 5th order harmonics and 2nd, 3rd, 4th and 5th order IMD for the UE-to-UE coexistence analysis.

Table 5.67.2-2: Band 7 and Band n12 UL harmonics and IMD products

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **UE UL carriers** | **fx\_low** | **fx\_high** | **fy\_low** | **fy\_high** |
| UL frequency (MHz) | 2500 | 2570 | 699 | 716 |
| 2nd harmonics frequency limits | 2\*fx\_low | 2\*fx\_high | 2\* fy\_low | 2\* fy\_high |
| 2nd harmonics frequency limits (MHz) | 5000 | 5140 | 1398 | 1432 |
| 3rd harmonics frequency limits | 3\*fx\_low | 3\*fx\_high | 3\* fy\_low | 3\* fy\_high |
| 3rd harmonics frequency limits (MHz) | 7500 | 7710 | 2097 | 2148 |
| 4th harmonics frequency limits | 4\*fx\_low | 4\*fx\_high | 4\* fy\_low | 4\* fy\_high |
| 4th harmonics frequency limits (MHz) | 10000 | 10280 | 2796 | 2864 |
| 5th harmonics frequency limits | 5\*fx\_low | 5\*fx\_high | 5\* fy\_low | 5\* fy\_high |
| 5th harmonics frequency limits (MHz) | 12500 | 12850 | 3495 | 3580 |
| 2nd order IMD products | |fy\_low – fx\_high| | |fy\_high – fx\_low| | |fy\_low + fx\_low| | |fy\_high + fx\_high| |
| IMD frequency limits (MHz) | 1871 | 1784 | 3199 | 3286 |
| Two-tone 3rd order IMD products | |2\*fx\_low – fy\_high| | |2\*fx\_high – fy\_low| | |2\*fy\_low – fx\_high| | |2\*fy\_high – fx\_low| |
| IMD frequency limits (MHz) | 4284 | 4441 | 1172 | 1068 |
| Two-tone 3rd order IMD products | |2\*fx\_low + fy\_low| | |2\*fx\_high + fy\_high| | |2\*fy\_low + fx\_low| | |2\*fy\_high + fx\_high| |
| IMD frequency limits (MHz) | 5699 | 5856 | 3898 | 4002 |
| Two-tone 4th order IMD products | |3\*fx\_low –1\* fy\_high| | |3\*fx\_high – 1\*fy\_low| | |3\*fy\_low – 1\*fx\_high| | |3\*fy\_high – 1\*fx\_low| |
| IMD frequency limits (MHz) | 6784 | 7011 | 473 | 352 |
| Two-tone 4th order IMD products | |3\*fx\_low +1\* fy\_low| | |3\*fx\_high + 1\*fy\_high| | |3\*fy\_low + 1\*fx\_low| | |3\*fy\_high + 1\*fx\_high| |
| IMD frequency limits (MHz) | 8199 | 8426 | 4597 | 4718 |
| Two-tone 4th order IMD products | |2\*fx\_low –2\* fy\_high| | |2\*fx\_high –2\* fy\_low| | |2\*fx\_low +2\* fy\_low| | |2\*fx\_high +2\* fy\_high| |
| IMD frequency limits (MHz) | 3568 | 3742 | 6398 | 6572 |
| Two-tone 5th order IMD products | |fx\_low – 4\*fy\_high| | |fx\_high – 4\*fy\_low| | |fy\_low – 4\*fx\_high| | |fy\_high – 4\*fx\_low| |
| IMD frequency limits (MHz) | 364 | 226 | 9581 | 9284 |
| Two-tone 5th order IMD products | |2\*fx\_low - 3\*fy\_high| | |2\*fx\_high - 3\*fy\_low| | |2\*fy\_low - 3\*fx\_high| | |2\*fy\_high -3\*fx\_low| |
| IMD frequency limits (MHz) | 2852 | 3043 | 6312 | 6068 |
| Two-tone 5th order IMD products | |fx\_low + 4\*fy\_low| | |fx\_high + 4\*fy\_high| | |fy\_low + 4\*fx\_low| | |fy\_high + 4\*fx\_high| |
| IMD frequency limits (MHz) | 5296 | 5434 | 10699 | 10996 |
| Two-tone 5th order IMD products | |2\*fx\_low + 3\*fy\_low| | |2\*fx\_high + 3\*fy\_high| | |2\*fy\_low + 3\*fx\_low| | |2\*fy\_high + 3\*fx\_high| |
| IMD frequency limits (MHz) | 7097 | 7288 | 8898 | 9142 |

From the above table, there is no IMD impact from UL 7\_n12 affecting DL band 7, 2 and n12.

### 5.67.3 ∆TIB and ∆RIB values

For DC\_2-7\_n12, the ΔTIB,c and ΔRIB,c values are reused from DC\_2-7\_n28 are given in the tables below.

Table 5.67.3-1: ΔTIB,c

| Inter-band EN-DC configuration | ΔTIB,c for E-UTRA band / NR band (dB)6 | | |
| --- | --- | --- | --- |
| Component band in order of bands in configuration7 | | |
| DC\_2-7\_n12  DC\_2-2-7\_n12 | 0.5 | 0.5 | 0.3 |
| NOTE 6: “-” denotes ΔTIB,c = 0.  NOTE 7: The component band order in the configuration should be listed by the order of E-UTRA band and NR band respectively, such as for DC\_66\_(n)12 the band order from left to right is 12, 66 and n12. | | | |

**Table 5.67.3-2: ΔRIB**

| **nter-band EN-DC configuration** | ΔRIB,c for E-UTRA band / NR band (dB)7 | | |
| --- | --- | --- | --- |
| Component band in order of bands in configuration8 | | |
| DC\_2-7\_n12  DC\_2-2-7\_n12 | - | - | - |
| NOTE 7: “-” denotes ΔRIB,c = 0.  NOTE 8: The component band order in the configuration should be listed by the order of E-UTRA band and NR band respectively, such as for DC\_5\_(n)12 the band order from left to right is 5, 12 and n12. | | | |

### 5.67.4 Reference sensitivity exceptions

The MSD value of DC\_7A-12A\_n2A is reused for DC\_2A-7A\_n12A and given as follow:

Table 5.59-1: 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\_n12A | 2 | 1907.5 | 5 | 25 | 1987.5 | N/A | N/A |
|  | 7 | 2502.5 | 5 | 25 | 2622.5 | 30.8 | IMD2 |
|  | n12 | 713.5 | 5 | 25 | 743.5 | N/A | N/A |

## 5.68 DC\_5-7\_n25

### 5.68.1 Configurations for DC

Table 5.68.1-1: Inter-band DC configurations (three bands)

| **EN-DC**  **configuration** | **Uplink EN-DC**  **configuration** |
| --- | --- |
| DC\_5A-7A\_n25A | DC\_5A\_n25A  DC\_7A\_n25A |

### 5.68.2 Co-existence studies

Based on co-existence studies of DC\_5\_n25 and DC\_7\_n25, own Rx impact of the 3rd band is the followings.

- 2nd order IMD products generated by DC\_5\_n25 uplink may fall into own Rx of band 7.

### 5.68.3 ∆TIB and ∆RIB values

For DC\_5-7\_n25, the ΔTIB,c and ΔRIB,c values are reused from CA\_n2-n5-n41 are given in the tables below.

Table 5.68.3-1: ΔTIB,c

| Inter-band EN-DC configuration | ΔTIB,c for E-UTRA band / NR band (dB)6 | | |
| --- | --- | --- | --- |
| Component band in order of bands in configuration7 | | |
| DC\_5-7\_n25 | 0.6 | 0.4 | 0.5 |
| NOTE 6: “-” denotes ΔTIB,c = 0.  NOTE 7: The component band order in the configuration should be listed by the order of E-UTRA band and NR band respectively, such as for DC\_66\_(n)12 the band order from left to right is 12, 66 and n12. | | | |

**Table 5.68.3-2: ΔRIB**

| **nter-band EN-DC configuration** | ΔRIB,c for E-UTRA band / NR band (dB)7 | | |
| --- | --- | --- | --- |
| Component band in order of bands in configuration8 | | |
| DC\_5-7\_n25 | 0.2 | - | - |
| NOTE 7: “-” denotes ΔRIB,c = 0.  NOTE 8: The component band order in the configuration should be listed by the order of E-UTRA band and NR band respectively, such as for DC\_5\_(n)12 the band order from left to right is 5, 12 and n12. | | | |

### 5.68.4 Reference sensitivity exceptions

Table 5.68.4-1 lists the MSD required for the dual connectivity configuration for the cases that IMD interference fall into the own 3rd Rx frequency band. The MSD values for CA\_n2-n5-n41 are reused.

Table 5.68.4-1: MSD for the DC configuration

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| 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\_5A-7A\_n25A | 5 | 1855 | 5 | 25 | 1935 | N/A | N/A |
|  | 7 | 2565 | 5 | 25 | 2685 | 30.0 | IMD2 |
|  | n25 | 830 | 5 | 25 | 875 | N/A | N/A |

## 5.69 DC\_5-66\_n25

### 5.69.1 Configurations for DC

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

| **EN-DC**  **configuration** | **Uplink EN-DC**  **configuration** |
| --- | --- |
| DC\_5A-66A\_n25A | DC\_5A\_n25A  DC\_66A\_n25A |

### 5.69.2 Co-existence studies

Based on co-existence studies of DC\_5\_n25 and DC\_66\_n25, own Rx impact of the 3rd band is the followings.

- 4th order IMD products generated by DC\_5\_n25 uplink may fall into own Rx of band 66.

### 5.69.3 ∆TIB and ∆RIB values

For DC\_5-66\_n25, the ΔTIB,c and ΔRIB,c values are reused from DC\_5-66\_n2 are given in the tables below.

Table 5.69.3-1: ΔTIB,c

| Inter-band EN-DC configuration | ΔTIB,c for E-UTRA band / NR band (dB)6 | | |
| --- | --- | --- | --- |
| Component band in order of bands in configuration7 | | |
| DC\_5-66\_n25 | 0.3 | 0.5 | 0.5 |
| NOTE 6: “-” denotes ΔTIB,c = 0.  NOTE 7: The component band order in the configuration should be listed by the order of E-UTRA band and NR band respectively, such as for DC\_66\_(n)12 the band order from left to right is 12, 66 and n12. | | | |

**Table 5.69.3-2: ΔRIB**

| **nter-band EN-DC configuration** | ΔRIB,c for E-UTRA band / NR band (dB)7 | | |
| --- | --- | --- | --- |
| Component band in order of bands in configuration8 | | |
| DC\_5-66\_n25 | - | 0.3 | 0.3 |
| NOTE 7: “-” denotes ΔRIB,c = 0.  NOTE 8: The component band order in the configuration should be listed by the order of E-UTRA band and NR band respectively, such as for DC\_5\_(n)12 the band order from left to right is 5, 12 and n12. | | | |

### 5.69.4 Reference sensitivity exceptions

Table 5.69.4-1 lists the MSD required for the dual connectivity configuration for the cases that IMD interference fall into the own 3rd Rx frequency band. The MSD values for DC\_5A-66A\_n2A are reused.

Table 5.69.4-1: MSD for the DC configuration

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| 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\_5A-66A\_n25A | 5 | 834 | 5 | 25 | 879 | N/A | N/A |
|  | 66 | 1732 | 5 | 25 | 2132 | 7.2 | IMD4 |
|  | n25 | 1900 | 5 | 25 | 1980 | N/A | N/A |

## 5.70 DC\_5-66\_n41

### 5.70.1 Configurations for DC

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

| **EN-DC**  **configuration** | **Uplink EN-DC**  **configuration** |
| --- | --- |
| DC\_5A-66A\_n41A | DC\_5A\_n41A  DC\_66A\_n41A |

### 5.70.2 Co-existence studies

Based on co-existence studies of DC\_5\_n41 and DC\_66\_n41, own Rx impact of the 3rd band is the followings.

- 2nd and 3rd order IMD products generated by DC\_66\_n41 uplink may fall into own Rx of band 5

### 5.70.3 ∆TIB and ∆RIB values

For DC\_5-66\_n41, the ΔTIB,c and ΔRIB,c values are reused from CA\_n5-n41-n66 are given in the tables below.

Table 5.70.3-1: ΔTIB,c

| Inter-band EN-DC configuration | ΔTIB,c for E-UTRA band / NR band (dB)6 | | |
| --- | --- | --- | --- |
| Component band in order of bands in configuration7 | | |
| DC\_5-66\_n41 | 0.6 | 0.5 | 0.81 / 1.32 |
| NOTE 6: “-” denotes ΔTIB,c = 0.  NOTE 7: The component band order in the configuration should be listed by the order of E-UTRA band and NR band respectively, such as for DC\_66\_(n)12 the band order from left to right is 12, 66 and n12.  NOTE 1: The requirement is applied for UE transmitting on the frequency range of 2545 - 2690 MHz.  NOTE 2: The requirement is applied for UE transmitting on the frequency range of 2496 - 2545 MHz. | | | |

**Table 5.70.3-2: ΔRIB**

| **nter-band EN-DC configuration** | ΔRIB,c for E-UTRA band / NR band (dB)7 | | |
| --- | --- | --- | --- |
| Component band in order of bands in configuration8 | | |
| DC\_5-66\_n41 | 0.2 | 0.5 | 0.51 / 12 |
| NOTE 7: “-” denotes ΔRIB,c = 0.  NOTE 8: The component band order in the configuration should be listed by the order of E-UTRA band and NR band respectively, such as for DC\_5\_(n)12 the band order from left to right is 5, 12 and n12.  NOTE 1: The requirement is applied for UE transmitting on the frequency range of 2545 - 2690 MHz.  NOTE 2: The requirement is applied for UE transmitting on the frequency range of 2496 - 2545 MHz. | | | |

### 5.70.4 Reference sensitivity exceptions

Table 5.70.4-1 lists the MSD required for the dual connectivity configuration for the cases that IMD interference fall into the own 3rd Rx frequency band. The MSD values for CA\_n5A-n41A-n66A and DC\_5A-66A\_n7A are reused.

Table 5.70.4-1: MSD for the DC configuration

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| 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\_5A-66A\_n41A | 5 | 830 | 5 | 25 | 875 | 28.9 | IMD2 |
|  | 66 | 1765 | 5 | 25 | 2165 | N/A | N/A |
|  | n41 | 2640 | 10 | 50 | 2640 | N/A | N/A |
|  | 5 | 835 | 5 | 25 | 880 | 18.0 | IMD3 |
|  | 66 | 1720 | 5 | 25 | 2120 | N/A | N/A |
|  | n41 | 2560 | 10 | 50 | 2560 | N/A | N/A |

## 5.71 DC\_7-71\_n12

### 5.71.1 Configurations for DC

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

| **EN-DC**  **configuration** | **Uplink EN-DC**  **configuration** |
| --- | --- |
| DC\_7A-71A\_n12A | DC\_7A\_n12A |

### 5.71.2 Co-existence studies

Based on co-existence studies of DC\_7\_n12, there is no own Rx impact of the 3rd band for this combination.

### 5.71.3 ∆TIB and ∆RIB values

For DC\_7-71\_n12, the ΔTIB,c and ΔRIB,c values are reused from DC\_7-28\_n5 are given in the tables below.

Table 5.71.3-1: ΔTIB,c

| Inter-band EN-DC configuration | ΔTIB,c for E-UTRA band / NR band (dB)6 | | |
| --- | --- | --- | --- |
| Component band in order of bands in configuration7 | | |
| DC\_7-71\_n12 | 0.5 | 0.5 | 0.3 |
| NOTE 6: “-” denotes ΔTIB,c = 0.  NOTE 7: The component band order in the configuration should be listed by the order of E-UTRA band and NR band respectively, such as for DC\_66\_(n)12 the band order from left to right is 12, 66 and n12. | | | |

**Table 5.71.3-2: ΔRIB**

| **nter-band EN-DC configuration** | ΔRIB,c for E-UTRA band / NR band (dB)7 | | |
| --- | --- | --- | --- |
| Component band in order of bands in configuration8 | | |
| DC\_7-71\_n12 | - | - | - |
| NOTE 7: “-” denotes ΔRIB,c = 0.  NOTE 8: The component band order in the configuration should be listed by the order of E-UTRA band and NR band respectively, such as for DC\_5\_(n)12 the band order from left to right is 5, 12 and n12. | | | |

### 5.71.4 Reference sensitivity exceptions

Based on the co-existence study in 5.71.2, there is no need to define any MSD values.

## 5.72 DC\_12-71\_n2

### 5.72.1 Configurations for DC

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

| **EN-DC**  **configuration** | **Uplink EN-DC**  **configuration** |
| --- | --- |
| DC\_12A-71A\_n2A | DC\_12A\_n2A  DC\_71A\_n2A |

### 5.72.2 Co-existence studies

Based on co-existence studies of DC\_12\_n2 and DC\_71\_n2, own Rx impact of the 3rd band is the followings.

- 5th order IMD products generated by DC\_71\_n2 uplink may fall into own Rx of band 12.

### 5.72.3 ∆TIB and ∆RIB values

For DC\_12-71\_n2, the ΔTIB,c and ΔRIB,c values are reused from DC\_2-5\_n71are given in the tables below.

Table 5.72.3-1: ΔTIB,c

| Inter-band EN-DC configuration | ΔTIB,c for E-UTRA band / NR band (dB)6 | | |
| --- | --- | --- | --- |
| Component band in order of bands in configuration7 | | |
| DC\_12-71\_n2 | 0.5 | 0.5 | 0.3 |
| NOTE 6: “-” denotes ΔTIB,c = 0.  NOTE 7: The component band order in the configuration should be listed by the order of E-UTRA band and NR band respectively, such as for DC\_66\_(n)12 the band order from left to right is 12, 66 and n12. | | | |

**Table 5.72.3-2: ΔRIB**

| **nter-band EN-DC configuration** | ΔRIB,c for E-UTRA band / NR band (dB)7 | | |
| --- | --- | --- | --- |
| Component band in order of bands in configuration8 | | |
| DC\_12-71\_n2 | - | - | - |
| NOTE 7: “-” denotes ΔRIB,c = 0.  NOTE 8: The component band order in the configuration should be listed by the order of E-UTRA band and NR band respectively, such as for DC\_5\_(n)12 the band order from left to right is 5, 12 and n12. | | | |

### 5.72.4 Reference sensitivity exceptions

Table 5.72.4-1 lists the MSD required for the dual connectivity configuration for the cases that IMD interference fall into the own 3rd Rx frequency band. The MSD values for DC\_2A-5A\_n71A are reused.

Table 5.72.4-1: MSD for the DC configuration

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| 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\_12A-71A\_n2A | 12 | 713.5 | 5 | 25 | 743.5 | 4.2 | IMD5 |
|  | 71 | 665.5 | 5 | 25 | 619.5 | N/A | N/A |
|  | n2 | 1907.5 | 5 | 25 | 1987.5 | N/A | N/A |

## 5.73 DC\_12-71\_n77

### 5.73.1 Configurations for DC

Table 5.73.1-1: Inter-band DC configurations (three bands)

| **EN-DC**  **configuration** | **Uplink EN-DC**  **configuration** |
| --- | --- |
| DC\_12A-71A\_n77A | DC\_12A\_n77A  DC\_71A\_n77A |

### 5.73.2 Co-existence studies

Based on co-existence studies of DC\_12\_n77 and DC\_71\_n77, own Rx impact of the 3rd band is the followings.

- 5th order IMD products generated by DC\_71\_n77 uplink may fall into own Rx of band 12.

- 5th order IMD products generated by DC\_12\_n77 uplink may fall into own Rx of band 71.

### 5.73.3 ∆TIB and ∆RIB values

For DC\_12-71\_n77, the ΔTIB,c and ΔRIB,c values are reused from CA\_n5-n12-n77 are given in the tables below.

Table 5.73.3-1: ΔTIB,c

| Inter-band EN-DC configuration | ΔTIB,c for E-UTRA band / NR band (dB)6 | | |
| --- | --- | --- | --- |
| Component band in order of bands in configuration7 | | |
| DC\_12-71\_n77 | 0.4 | 0.8 | 0.5 |
| NOTE 6: “-” denotes ΔTIB,c = 0.  NOTE 7: The component band order in the configuration should be listed by the order of E-UTRA band and NR band respectively, such as for DC\_66\_(n)12 the band order from left to right is 12, 66 and n12. | | | |

**Table 5.73.3-2: ΔRIB**

| **nter-band EN-DC configuration** | ΔRIB,c for E-UTRA band / NR band (dB)7 | | |
| --- | --- | --- | --- |
| Component band in order of bands in configuration8 | | |
| DC\_12-71\_n77 | 0.3 | 0.5 | 0.5 |
| NOTE 7: “-” denotes ΔRIB,c = 0.  NOTE 8: The component band order in the configuration should be listed by the order of E-UTRA band and NR band respectively, such as for DC\_5\_(n)12 the band order from left to right is 5, 12 and n12. | | | |

### 5.73.4 Reference sensitivity exceptions

Table 5.73.4-1 lists the MSD required for the dual connectivity configuration for the cases that IMD interference fall into the own 3rd Rx frequency band. The MSD values for CA\_n5A-n12A-n77A are reused.

Table 5.73.4-1: MSD for the DC configuration

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| 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\_12A-71A\_n77A | 12 | 702 | 5 | 25 | 732 | 4.4 | IMD5 |
|  | 71 | 667 | 5 | 25 | 621 | N/A | N/A |
|  | n77 | 3400 | 10 | 50 | 3400 | N/A | N/A |
|  | 12 | 701.5 | 5 | 25 | 731.5 | N/A | N/A |
|  | 71 | 690 | 5 | 25 | 644 | 3.9 | IMD5 |
|  | n77 | 3450 | 10 | 50 | 3450 | N/A | N/A |

## 5.74 DC\_66-71\_n12

### 5.74.1 Configurations for DC

Table 5.74.1-1: Inter-band DC configurations (three bands)

| **EN-DC**  **configuration** | **Uplink EN-DC**  **configuration** |
| --- | --- |
| DC\_66A-71A\_n12A | DC\_66A\_n12A |

### 5.74.2 Co-existence studies

Based on co-existence studies of DC\_66\_n12, there is no own Rx impact of the 3rd band for this combination.

### 5.74.3 ∆TIB and ∆RIB values

For DC\_66-71\_n2, the ΔTIB,c and ΔRIB,c values are reused from DC\_5-66\_n71 are given in the tables below.

Table 5.74.3-1: ΔTIB,c

| Inter-band EN-DC configuration | ΔTIB,c for E-UTRA band / NR band (dB)6 | | |
| --- | --- | --- | --- |
| Component band in order of bands in configuration7 | | |
| DC\_66-71\_n12 | 0.3 | 0.5 | 0.5 |
| NOTE 6: “-” denotes ΔTIB,c = 0.  NOTE 7: The component band order in the configuration should be listed by the order of E-UTRA band and NR band respectively, such as for DC\_66\_(n)12 the band order from left to right is 12, 66 and n12. | | | |

**Table 5.74.3-2: ΔRIB**

| **nter-band EN-DC configuration** | ΔRIB,c for E-UTRA band / NR band (dB)7 | | |
| --- | --- | --- | --- |
| Component band in order of bands in configuration8 | | |
| DC\_66-71\_n12 | - | - | - |
| NOTE 7: “-” denotes ΔRIB,c = 0.  NOTE 8: The component band order in the configuration should be listed by the order of E-UTRA band and NR band respectively, such as for DC\_5\_(n)12 the band order from left to right is 5, 12 and n12. | | | |

### 5.74.4 Reference sensitivity exceptions

Based in the co-existence studies in 5.74.2, there is no need to define MSD values.

## 5.75 DC\_3-28\_n1

### 5.75.1 Configurations for DC

Table 5.75.1-1: Inter-band DC configurations (three bands)

| DC  Configuration | Uplink configuration |
| --- | --- |
| DC\_3C-28A\_n1A | DC\_3A\_n1A  DC\_3C\_n1A  DC\_28A\_n1A |

Note that UL DC\_3A\_n1A, DC\_28A\_n1A are already specified for this configuration in the specification.

### 5.75.2 Co-existence studies

The 2nd, 3rd and 4th order harmonics and 2nd, 3rd, 4th and 5th order intermodulation products had already been analyzed and specified for UL configuration DC\_3A\_n1A and DC\_28A\_n1A, respectively. Regarding UL configuration DC\_3C\_n1A, the following analysis is presented.

**Table 5.75.2-3: IMD (due to triple beats) analysis for UL configuration DC\_3C\_n1A**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **UE UL carriers** | **Band 3 case #1** | | **Band 3 case #2** | | **Band n1** | |
| **fx1\_low** | **fx2\_low** | **fx1\_high** | **fx2\_high** | **fy\_low** | **fy\_high** |
| UL frequency (MHz) | 1710 | 1750 | 1745 | 1785 | 1920 | 1980 |
| TB1 | |fx1\_low-fx2\_low+fy\_low | | |fx1\_low-fx2\_low+fy\_high | | |fx1\_high-fx2\_high+fy\_low | | |fx1\_high-fx2\_high+fy\_high | |  | |
| 1880 | 1940 | 1880 | 1940 |
| TB2 | |-fx1\_low+fx2\_low+fy\_low | | |-fx1\_low+fx2\_low+fy\_high | | |-fx1\_high+fx2\_high+fy\_low | | |-fx1\_high+fx2\_high+fy\_high| |
| 1960 | 2020 | 1960 | 2020 |
| TB3 | |-fx1\_low-fx2\_low+fy\_low | | |-fx1\_low-fx2\_low+fy\_high | | |-fx1\_high-fx2\_high+fy\_low | | |-fx1\_high-fx2\_high+fy\_high | |
| 1540 | 1480 | 1610 | 1550 |
| TB4 | |fx1\_low+fx2\_low+fy\_low | | |fx1\_low+fx2\_low+fy\_high | | |fx1\_high+fx2\_high+fy\_low | | |fx1\_high+fx2\_high+fy\_high | |
| 5380 | 5440 | 5450 | 5510 |

As we can see from the above table, there is no IMD to band 3, 28 or n1.

### 5.75.3 ∆TIB and ∆RIB values

The ΔTIB,c and ΔRIB,c values for DC\_3-28\_n1 have already been specified in TS 38.101-3.

### 5.75.4 Reference sensitivity exceptions

Compared to its fallback modes, no additional MSD requirements for this band combination are needed.

## 5.76 DC\_4-5\_n78

5.76.1 Configuration for DC

Table 5.76.1-1: Inter-band DC configurations (three bands)

| DC  Configuration | Uplink configuration |
| --- | --- |
| DC\_4A-5A\_n78A | DC\_4A\_n78A  DC\_5A\_n78A |

### 5.76.2 Co-existence studies

Based on co-existence studies of DC\_4\_n78 and DC\_5\_n78, own Rx impact of the 3rd band is the followings.

- 3nd order IMD products generated by DC\_5\_n78 uplink may fall into own Rx of band 4.

### 5.76.3 ∆TIB and ∆RIB values

For DC\_4-5\_n78, the ΔTIB,c values are reused from CA\_n3-n5-n78 and are given in the tables below.

Table 5.76.3-1: ΔTIB,c

| Inter-band EN-DC configuration | ΔTIB,c for E-UTRA band / NR band (dB)6 | | |
| --- | --- | --- | --- |
| Component band in order of bands in configuration7 | | |
| DC\_4-5\_n78 | 0.6 | 0.6 | 0.8 |
| NOTE 6: “-” denotes ΔTIB,c = 0.  NOTE 7: The component band order in the configuration should be listed by the order of E-UTRA band and NR band respectively, such as for DC\_66\_(n)12 the band order from left to right is 12, 66 and n12. | | | |

For DC\_4-5\_n78, the ΔRIB,c values are reused from CA\_n1-n5-n78 and are given in the tables below.

**Table 5.x.3-2: ΔRIB**

| **nter-band EN-DC configuration** | ΔRIB,c for E-UTRA band / NR band (dB)7 | | |
| --- | --- | --- | --- |
| Component band in order of bands in configuration8 | | |
| DC\_4-5\_n78 | 0.2 | 0.2 | 0.5 |
| NOTE 7: “-” denotes ΔRIB,c = 0.  NOTE 8: The component band order in the configuration should be listed by the order of E-UTRA band and NR band respectively, such as for DC\_5\_(n)12 the band order from left to right is 5, 12 and n12. | | | |

### 5.76.4 Reference sensitivity exceptions

Reusing the coexistence study results from EN-DC combination CA\_n1-n5-n78, MSD values should be defined as below:

Table 5.76.4-1: MSD for the DC configuration

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| 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\_4A-5A\_n78A | 4 | N/A | 5 | N/A | 2122 | 18.1 | IMD3 |
|  | 5 | 829 | 5 | 25 | 874 | N/A | N/A |
|  | n78 | 3780 | 10 | 50 | 3780 | N/A | N/A |

## 5.77 DC\_8-39\_n79

### 5.77.1 Configurations for DC

Table 5.77.1-1: Inter-band DC configurations (three bands)

| **EN-DC**  **configuration** | **Uplink EN-DC**  **configuration** |
| --- | --- |
| DC\_8A-39A\_n79A  DC\_8A-39A\_n79C | DC\_8A\_n79A  DC\_39A\_n79A |

### 5.77.2 Co-existence studies

In terms of the co-existence studies of the fallbacks of DC\_8\_n79 and DC\_39\_n79, which are captured in the TR 37.863-01-01, it can be found that:

* IMD4 products produced by Band 8 and Band n79 that impact the reference sensitivity of LTE band 39.
* IMD3, IMD4 products produced by Band 39 and Band n79 that impact the reference sensitivity of LTE band 8.

### 5.77.3 ∆TIB and ∆RIB values

For DC\_8-39\_n79, the ΔTIB,c and ΔRIB,c values are reused from DC\_8\_n39-n79 and given in the tables below.

**Table 5.77.3-1:ΔTIB,c due to EN-DC (three bands)**

| Inter-band EN-DC configuration | ΔTIB,c for E-UTRA band / NR band (dB)6 | | |
| --- | --- | --- | --- |
| Component band in order of bands in configuration7 | | |
| DC\_8-39\_n79 | 0.3 | 0.3 | 0.8 |
| NOTE 6: “-” denotes ΔTIB,c = 0.  NOTE 7: The component band order in the configuration should be listed by the order of E-UTRA band and NR band respectively, such as for DC\_66\_(n)12 the band order from left to right is 12, 66 and n12. | | | |

**Table 5.77.3-2:ΔRIB,c due to EN-DC (three bands)**

| **Inter-band EN-DC configuration** | ΔRIB,c for E-UTRA band / NR band (dB)7 | | |
| --- | --- | --- | --- |
| Component band in order of bands in configuration8 | | |
| DC\_8-39\_n79 | - | - | 0.5 |
| NOTE 7: “-” denotes ΔRIB,c = 0.  NOTE 8: The component band order in the configuration should be listed by the order of E-UTRA band and NR band respectively, such as for DC\_5\_(n)12 the band order from left to right is 5, 12 and n12. | | | |

### 5.77.4 Reference sensitivity exceptions

According to the co-existence study, the MSD values are defined as below, in which the corresponding MSD values are reused from the NR 3DL/2UL CA\_n8A-n39A-n79A

Table 5.77.4-1: MSD test points for Scell due to dual uplink operation for EN-DC in NR FR1 (three bands)

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| EN-DC Configuration | EUTRA / NR band | UL Fc  (MHz) | UL/DL BW  (MHz) | UL  LCRB | DL Fc (MHz) | MSD  (dB) | IMD order |
| DC\_8-39\_n79 | 8 | 897.5 | 5 | 25 | 942.5 | N/A | N/A |
|  | 39 | N/A | 5 | N/A | 1907.5 | 13.8 | IMD4 |
|  | n79 | 4600 | 40 | 216 | 4600 | N/A | N/A |
|  | 8 | 895 | 5 | 25 | 940 | 15.1 | IMD3 |
|  | 39 | 1900 | 10 | 50 | 1900 | N/A | N/A |
|  | n79 | 4740 | 40 | 216 | 4740 | N/A | N/A |
|  | 8 | N/A | 5 | N/A | 940 | 7.1 | IMD4 |
|  | 39 | 1900 | 5 | 25 | 1900 | N/A | N/A |
|  | n79 | 4760 | 40 | 216 | 4760 | N/A | N/A |

## 5.78 DC\_3-7\_n79, DC\_3-3-7\_n79, DC\_3-7-7\_n79, DC\_3-3-7-7\_n79

### 5.78.1 Configurations for DC

Table 5.78.1-1: Inter-band DC configurations (three bands)

| **EN-DC**  **configuration** | **Uplink EN-DC**  **configuration** |
| --- | --- |
| DC\_3A-7A\_n79A5 | DC\_3A\_n79A  DC\_7A\_n79A |
| DC\_3A-3A-7A\_n79A5 | DC\_3A\_n79A  DC\_7A\_n79A |
| DC\_3A-7A-7A\_n79A5 | DC\_3A\_n79A  DC\_7A\_n79A |
| DC\_3A-3A-7A-7A\_n79A5 | DC\_3A\_n79A  DC\_7A\_n79A |
| NOTE 5: Applicable for UE supporting inter-band EN-DC with mandatory simultaneous Rx/Tx capability | |

### 5.78.2 Co-existence studies

Based on the co-existence studies for the DC\_3\_n79, DC\_7\_n79, which are studied in section 6.6 of TR 37.863-01-01 and section 6.1.67 of TR 37.71-11-11, the own Rx impact on the 3rd band is listed below.

- IMD2 and IMD5 generated by dual uplink of Band 3 + Band n79 will fall into own Rx of Band 7.

- IMD2 and IMD5 generated by dual uplink of Band 7 + Band n79 will fall into own Rx of Band 3.

### 5.78.3 ∆TIB and ∆RIB values

For DC\_3-7\_n79, DC\_3-3-7\_n79, DC\_3-7-7\_n79, DC\_3-3-7-7\_n79, the ΔTIB,c and ΔRIB,c values are provided in the table below.

Table 5.78.3-1: ΔTIB,c

| Inter-band EN-DC configuration | ΔTIB,c for E-UTRA band / NR band (dB)6 | | |
| --- | --- | --- | --- |
| Component band in order of bands in configuration7 | | |
| DC\_3-7\_n79  DC\_3-3-7\_n79  DC\_3-7-7\_n79  DC\_3-3-7-7\_n79 | 0.5 | 0.5 | 0.8 |

**Table 5.78.3-2: ΔRIB**,c

| **Inter-band EN-DC configuration** | ΔRIB,c for E-UTRA band / NR band (dB)7 | | |
| --- | --- | --- | --- |
| Component band in order of bands in configuration8 | | |
| DC\_3-7\_n79  DC\_3-3-7\_n79  DC\_3-7-7\_n79  DC\_3-3-7-7\_n79 | - | - | 0.5 |

### 5.78.4 Reference sensitivity exceptions

Since based on the latest guideline in TR 38.846, the MSD value of the lowest even and the lowest odd order IMD, if any, shall be defined in the specifications. Therefore, both MSD for IMD2 and IMD5 of DC\_3A-7A\_n79A series are proposed in the table below. The values are reused from the DC\_3-41\_n79 which is studied in TR 37.716-21-11 with the full set of requirements.

**Table 5.78.4-1: 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-7A\_n79A  DC\_3A-3A-7A\_n79A  DC\_3A-7A-7A\_n79A  DC\_3A-3A-7A-7A\_n79A | 3 | 1770 | 5 | 25 | 1865 | N/A | N/A |
|  | n79 | 4440 | 10 | 50 | 4440 | N/A | N/A |
|  | 7 | N/A | 5 | N/A | 2670 | 30.2 | IMD2 |
|  | 3 | 1770 | 5 | 25 | 1865 | N/A | N/A |
|  | n79 | 4440 | 10 | 50 | 4440 | N/A | N/A |
|  | 7 | N/A | 5 | N/A | 2640 | 5.0 | IMD5 |
|  | 7 | 2565 | 5 | 25 | 2685 | N/A | N/A |
|  | n79 | 4420 | 10 | 50 | 4420 | N/A | N/A |
|  | 3 | N/A | 5 | N/A | 1855 | 29.4 | IMD2 |
|  | 7 | 2550 | 5 | 25 | 2670 | N/A | N/A |
|  | n79 | 4745 | 10 | 50 | 4745 | N/A | N/A |
|  | 3 | N/A | 5 | N/A | 1840 | 4.8 | IMD5 |

## 5.79 DC\_3-5\_n28

### 5.79.1 Configurations for DC

Table 5.79.1-1: Inter-band DC configurations (three bands)

| **EN-DC**  **configuration** | **Uplink EN-DC**  **configuration** |
| --- | --- |
| DC\_3A-5A\_n28A | DC\_3A\_n28A  DC\_5A\_n28A |

### 5.79.2 Co-existence studies

Based on co-existence studies of DC\_3\_n28 and DC\_5\_n28, own Rx impact of the 3rd band is the followings:

- 4th order IMD products generated by DC\_5\_n28 uplink may fall into own Rx of band 3.

### 5.79.3 ∆TIB and ∆RIB values

For DC\_3-5\_n28, the ΔTIB,c and ΔRIB,c values are reused from DC\_3-28\_n5 are given in the tables below.

Table 5.79.3-1: ΔTIB,c

| Inter-band EN-DC configuration | ΔTIB,c for E-UTRA band / NR band (dB)6 | | |
| --- | --- | --- | --- |
| Component band in order of bands in configuration7 | | |
| DC\_3-5\_n28 | 0.3 | 0.7 | 0.7 |
| NOTE 6: “-” denotes ΔTIB,c = 0.  NOTE 7: The component band order in the configuration should be listed by the order of E-UTRA band and NR band respectively, such as for DC\_66\_(n)12 the band order from left to right is 12, 66 and n12. | | | |

**Table 5.79.3-2: ΔRIB**

| **nter-band EN-DC configuration** | ΔRIB,c for E-UTRA band / NR band (dB)7 | | |
| --- | --- | --- | --- |
| Component band in order of bands in configuration8 | | |
| DC\_3-5\_n28 | - | 0.2 | 0.2 |
| NOTE 7: “-” denotes ΔRIB,c = 0.  NOTE 8: The component band order in the configuration should be listed by the order of E-UTRA band and NR band respectively, such as for DC\_5\_(n)12 the band order from left to right is 5, 12 and n12. | | | |

### 5.79.4 Reference sensitivity exceptions

Table 5.79.4-1 lists the MSD required for the dual connectivity configuration for the cases that IMD interference fall into the own 3rd Rx frequency band. The MSD values for DC\_3A-28A\_n5A are reused.

Table 5.79.4-1: MSD for the DC configuration

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| 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-5A\_n28A | 3 | N/A | 5 | N/A | 1829.5 | 8.7 | IMD4 |
|  | 5 | 845 | 5 | 25 | 890 | N/A | N/A |
|  | n28 | 705.5 | 5 | 25 | 760.5 | N/A | N/A |

## 5.80 DC\_5-7\_n28

### 5.80.1 Configurations for DC

Table 5.80.1-1: Inter-band DC configurations (three bands)

| **EN-DC**  **configuration** | **Uplink EN-DC**  **configuration** |
| --- | --- |
| DC\_5A-7A\_n28A | DC\_5A\_n28A  DC\_7A\_n28A |

### 5.80.2 Co-existence studies

Based on co-existence studies of DC\_7\_n28 and DC\_5\_n28, own Rx impact of the 3rd band is the followings:

- 5th order IMD products generated by DC\_5\_n28 uplink may fall into own Rx of band 7.

### 5.80.3 ∆TIB and ∆RIB values

For DC\_5-7\_n28, the ΔTIB,c and ΔRIB,c values are reused from DC\_7A-20A\_n28A are given in the tables below.

Table 5.80.3-1: ΔTIB,c

| Inter-band EN-DC configuration | ΔTIB,c for E-UTRA band / NR band (dB)6 | | |
| --- | --- | --- | --- |
| Component band in order of bands in configuration7 | | |
| DC\_5-7\_n28 | 0.7 | 0.3 | 0.7 |
| NOTE 6: “-” denotes ΔTIB,c = 0.  NOTE 7: The component band order in the configuration should be listed by the order of E-UTRA band and NR band respectively, such as for DC\_66\_(n)12 the band order from left to right is 12, 66 and n12. | | | |

**Table 5.80.3-2: ΔRIB**

| **nter-band EN-DC configuration** | ΔRIB,c for E-UTRA band / NR band (dB)7 | | |
| --- | --- | --- | --- |
| Component band in order of bands in configuration8 | | |
| DC\_5-7\_n28 | 0.2 | - | 0.2 |
| NOTE 7: “-” denotes ΔRIB,c = 0.  NOTE 8: The component band order in the configuration should be listed by the order of E-UTRA band and NR band respectively, such as for DC\_5\_(n)12 the band order from left to right is 5, 12 and n12. | | | |

### 5.80.4 Reference sensitivity exceptions

Table 5.80.4-1 lists the MSD required for the dual connectivity configuration for the cases that IMD interference fall into the own 3rd Rx frequency band. The MSD values for DC\_7A-20A\_n28A are reused.

Table 5.80.4-1: MSD for the DC configuration

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| 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\_5A-7A\_n28A | 5 | 842 | 5 | 25 | 887 | N/A | N/A |
|  | 7 | N/A | 5 | N/A | 2640 | 5.9 | IMD5 |
|  | n28 | 728 | 5 | 25 | 783 | N/A | N/A |

## 5.81 DC\_1-5\_n28

### 5.81.1 Configurations for DC

Table 5.81.1-1: Inter-band DC configurations (three bands)

| **EN-DC**  **configuration** | **Uplink EN-DC**  **configuration** |
| --- | --- |
| DC\_1A-5A\_n28A | DC\_1A\_n28A  DC\_5A\_n28A |

### 5.81.2 Co-existence studies

Based on co-existence studies of DC\_1\_n28 and DC\_5\_n28, own Rx impact of the 3rd band is the followings:

- 5th order IMD products generated by DC\_1\_n28 uplink may fall into own Rx of band 5.

- 5th order IMD products generated by DC\_5\_n28 uplink may fall into own Rx of band 1.

### 5.81.3 ∆TIB and ∆RIB values

For DC\_1-5\_n28, the ΔTIB,c and ΔRIB,c values are reused from CA\_n1-n18-n28 are given in the tables below.

Table 5.81.3-1: ΔTIB,c

| Inter-band EN-DC configuration | ΔTIB,c for E-UTRA band / NR band (dB)6 | | |
| --- | --- | --- | --- |
| Component band in order of bands in configuration7 | | |
| DC\_1-5\_n28 | 0.3 | 0.5 | 0.6 |
| NOTE 6: “-” denotes ΔTIB,c = 0.  NOTE 7: The component band order in the configuration should be listed by the order of E-UTRA band and NR band respectively, such as for DC\_66\_(n)12 the band order from left to right is 12, 66 and n12. | | | |

**Table 5.81.3-2: ΔRIB**

| **nter-band EN-DC configuration** | ΔRIB,c for E-UTRA band / NR band (dB)7 | | |
| --- | --- | --- | --- |
| Component band in order of bands in configuration8 | | |
| DC\_1-5\_n28 | - | - | 0.2 |
| NOTE 7: “-” denotes ΔRIB,c = 0.  NOTE 8: The component band order in the configuration should be listed by the order of E-UTRA band and NR band respectively, such as for DC\_5\_(n)12 the band order from left to right is 5, 12 and n12. | | | |

### 5.81.4 Reference sensitivity exceptions

Table 5.81.4-1 lists the MSD required for the dual connectivity configuration for the cases that IMD interference fall into the own 3rd Rx frequency band. The MSD values for CA\_n1-n18-n28 are reused.

Table 5.81.4-1: MSD for the DC configuration

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| 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-5A\_n28A | 1 | N/A | 5 | N/A | 2123 | 4 | IMD5 |
|  | 5 | 829 | 5 | 25 | 874 | N/A | N/A |
|  | n28 | 738 | 5 | 25 | 793 | N/A | N/A |
|  | 1 | 1965 | 5 | 25 | 2155 | N/A | N/A |
|  | 5 | N/A | 5 | N/A | 875 | 4.6 | IMD5 |
|  | n28 | 710 | 5 | 25 | 765 | N/A | N/A |

# Annex A (informative): Change history

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Change history** | | | | | | | |
| **Date** | **Meeting** | **TDoc** | **CR** | **Rev** | **Cat** | **Subject/Comment** | **New version** |
| 2022-8 | RAN4#104-e | R4-2212499 |  |  |  | TR skeleton | 0.0.1 |
| 2022-8 | RAN4#104-e | R4-2212500 |  |  |  | The following approved TPs were implemented:  R4-2215008 TP for TR 37 718-21-11 to include DC\_1-(n)7  R4-2215009 TP for TR 37 718-21-11 to include DC\_3-(n)7  R4-2215010 TP for TR 37 718-21-11 to include DC\_28-(n)7  R4-2215011 TP for TR 37 718-21-11 to include DC\_1-26\_n78  R4-2215012 TP for TR 37 718-21-11 to include DC\_3-26\_n78  R4-2215013 TP for TR 37 718-21-11 to include DC\_7-26\_n78  R4-2215031 TP for TR 37.718-21-11 DC\_1A-8A\_n7A | 0.1.0 |
| 2022-10 | RAN4#104-bis-e | R4-2216246 |  |  |  | The following approved TPs were implemented:  R4-2215771 TP for TR 37.718-21-11: support of DC\_3A-8B\_n78A, DC\_3A-3A-8B\_n78A  R4-2215772 TP for TR 37.718-21-11: support of DC\_7A-8B\_n78A, DC\_7A-7A-8B\_n78A  R4-2215849 TP for TR 37.718-21-11 to include DC\_1\_3-n26  R4-2215850 TP for TR 37.718-21-11 to include DC\_1\_7-n26  R4-2217104 TP for TR 37.718-21-11 to include DC\_3\_7-n26  R4-2215901 TP for TR 37.718-21-11: Including band combinations DC\_3-41\_n1  R4-2215902 TP for TR 37.718-21-11: Including band combinations DC\_8-41\_n78  R4-2216092 TP for TR 37 718-21-11 to include DC\_20-41\_n1  R4-2216093 TP for TR 37 718-21-11 to include DC\_20-41\_n78  R4-2216161 TP for TR 37.718-21-11: DC\_1-7\_n1  R4-2217067 TP for TR 37.718-21-11: DC\_1-7\_n20  R4-2217068 TP for TR 37.718-21-11: DC\_1-8\_n20  R4-2217071 TP for TR 37.718-21-11: DC\_3-20\_n3  R4-2217072 TP for TR 37.718-21-11: DC\_3-32\_n7  R4-2217075 TP for TR 37.718-21-11: DC\_8-28\_n3  R4-2217077 TP for TR 37.718-21-11: DC\_20-32\_n7  R4-2216249 TP for TR 37.718-21-11: update the format of tables for ?TIB and ?RIB values  R4-2216591 TP for TR 37.718-21-11 DC\_7A-8A\_n7A  R4-2216625 TP for TR 37.718-21-11 on table templates and error corrections | 0.2.0 |
| 2022-11 | RAN4#105 | R4-2219165 |  |  |  | The following approved TPs were implemented:  R4-2218525 TP for TR 37.718-21-11 DC\_3A-5A\_n40A  R4-2218958 TP for 37.718-21-11 to include DC\_1-28\_n38  R4-2218959 TP for 37.718-21-11 to include DC\_3-28\_n38  R4-2219282 TP for TR 37.718-21-11: DC\_20-28\_n78  R4-2219338 TP for TR 37.718-21-11: DC\_1-28\_n20  R4-2220607 TP for TR 37.718-21-11 DC\_1A-5A\_n40A  R4-2220773 TP for TR 37.718-21-11: DC\_1-3\_n1  R4-2220774 TP for TR 37.718-21-11: DC\_1-20\_n1  R4-2220775 TP for TR 37.718-21-11: DC\_7-8\_n20  R4-2220776 TP for TR 37.718-21-11: DC\_7-28\_n20 | 0.3.0 |
| 2023-03 | RAN4#106 | R4-2301454 |  |  |  | The following approved TPs were implemented:  R4-2220568 TP for TR 37.718-21-11: DC\_3-7\_n26  R4-2216086 TP for TR 37 718-21-11 to update DC\_3-(n)7  R4-2300180 TP for TR 37.718-21-11 to include DC\_5-7\_n40  R4-2303610 TP for 37.718-21-11 to include DC\_20-(n)3  R4-2301769 TP for TR 37.718-21-11 DC\_3A-8A\_n7A | 0.4.0 |
| 2023-04 | RAN4#106bis-e | R4-2305310 |  |  |  | The following approved TPs were implemented:  R4-2306483 TP for TR 37.718-21-11: support of DC\_3A\_8B\_n78A, DC\_3A-3A\_8B\_n78A with UL DC\_8B\_n78A  R4-2305311 TP for TR 37.718-21-11: update the tables for ?TIB and ?RIB values  R4-2305576 TP for TR 37.718-21-11: support of DC\_7A\_8B\_n78A, DC\_7A-7A\_8B\_n78A with UL DC\_8B\_n78A  R4-2306491 TP for 37.718-21-11 to include DC\_3-67\_n3  R4-2306492 TP for 37.718-21-11 to include DC\_67-(n)3  R4-2306493 TP for 37.718-21-11 to include DC\_20-67\_n3  R4-2306652 TP for TR 37.718-21-11 DC\_3A-8A\_n41A | 0.5.0 |
| 2023-05 | RAN4#107 | R4-2307767 |  |  |  | R4-2310331 TP for 37.718-11-21 to include DC\_1A-3A\_n105A  R4-2310333 TP for 37.718-11-21 to include DC\_1A-7A\_n105A  R4-2310337 TP for 37.718-11-21 to include DC\_3A-7A\_n105A  R4-2310298 TP for TR 37.718-21-11: updated MSD for DC\_3A\_8B\_n78A with UL DC\_8B\_n78A  R4-2310326 TP to TR 37.718-21-11 Addition of DC\_2\_4\_n78  R4-2310327 TP to TR 37.718-21-11 Addition of DC\_28\_38\_n78  R4-2310328 TP to TR 37.718-21-11 Addition of DC\_4\_7\_n78  R4-2308145 TP for TR 37.718-21-11 DC\_66A-71A\_n25A  R4-2310339 TP for TR 37.718-21-11: updates for DC\_3A-8A\_n41A  R4-2310340 TP for 37.718-21-11 to include DC\_2A-71A\_n7A  R4-2309519 TP for 37.718-21-11 to include DC\_2A-71A\_n77A  R4-2309520 TP for 37.718-21-11 to include DC\_7A-71A\_n77A  R4-2310341 TP for 37.718-21-11 to include DC\_66A-71A\_n77A  R4-2309522 TP for 37.718-21-11 to include DC\_7A-12A\_n77A  R4-2309523 TP for 37.718-21-11 to include DC\_7A-12A\_n25A  R4-2309524 TP for 37.718-21-11 to include DC\_7A-66A\_n12A  R4-2309525 TP for 37.718-21-11 to include DC\_7A-71A\_n25A  R4-2309528 TP for 37.718-21-11 to include DC\_12A-66A\_n7A  R4-2309529 TP for 37.718-21-11 to include DC\_66A-71A\_n7A | 0.6.0 |
| 2023-08 | RAN4#108 | R4-2312324 |  |  |  | The following approved TPs were implemented:  R4-2314815 TP for 37.718-21-11 to add DC\_2A-7A\_n12A  R4-2314816 TP to 37.718-21-11 to add DC\_66A-71A\_n2(2A)  R4-2311466 TP to 37.718-21-11to add DC\_2A-5A\_n41A  R4-2311467 TP to 37.718-21-11 to add DC\_7A-66A\_n2(2A)  R4-2314824 TP for TR 37.718-21-11 DC\_3-40\_n77  R4-2311952 TP for TR 37.718-21-11 DC\_5-40\_n77  R4-2311953 TP for TR 37.718-21-11 DC\_5-40\_n78  R4-2314841 TP for 37.718-21-11 to include DC\_2A-5A\_n41A  R4-2314842 TP for 37.718-21-11 to include DC\_2A-7A\_n12A  R4-2313152 TP for 37.718-21-11 to include DC\_5A-7A\_n25A  R4-2314843 TP for 37.718-21-11 to include DC\_5A-66A\_n25A  R4-2314844 TP for 37.718-21-11 to include DC\_5A-66A\_n41A  R4-2314845 TP for 37.718-21-11 to include DC\_7A-71A\_n12A  R4-2314846 TP for 37.718-21-11 to include DC\_12A-71A\_n2A  R4-2314847 TP for 37.718-21-11 to include DC\_12A-71A\_n77A  R4-2314848 TP for 37.718-21-11 to include DC\_66A-71A\_n12A | 0.7.0 |
| 2023-10 | RAN4#108bis | R4-2316389 |  |  |  | The following approved TPs were implemented:  R4-2316334 TP to TR37.718-21-11 to add DC\_8A-39A\_n40A  R4-2316335 TP to TR37.718-21-11 to add DC\_8A-39A\_n41A and DC\_8A-39A\_n41C  R4-2317672 TP for TR 37.718-21-11 DC\_3C-28A\_n1A  R4-2316390 TP for TR 37.718-21-11: merge the subclauses for DC\_2-5\_n41 and DC\_2-7\_n12 | 0.8.0 |
| 2023-11 | RAN4#09 | R4-319702 |  |  |  | The following approved TPs were implemented:  R4-2319517 TP for TR 37.718-21-11 to introduce DC\_4A-5A\_n78A  R4-2321896 TP to TR37.718-21-11 to add DC\_8A-39A\_n79A and DC\_8A-39A\_n79C  R4-2320588 TP for TR 37.718-21-11: support of DC\_3\_7\_n79, DC\_3-3-7\_n79, DC\_3-7-7\_n79, DC\_3-3-7-7\_n79  R4-2319673 TP for 37.718-21-11 to include DC\_3A-5A\_n28A  R4-2320852 TP for 37.718-21-11 to include DC\_5A-7A\_n28A  R4-2321894 TP for 37.718-21-11 to include DC\_1A-5A\_n28A | 0.9.0 |
|  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |