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| 3GPP TR 37.717-21-11 V0.3.0 (2021-02) | |
| 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 17) | |
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# Foreword

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

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

Version x.y.z

where:

x the first digit:

1 presented to TSG for information;

2 presented to TSG for approval;

3 or greater indicates TSG approved document under change control.

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

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

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

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

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

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

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

**should** indicates a recommendation to do something

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

**may** indicates permission to do something

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

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

**can** indicates that something is possible

**cannot** indicates that something is impossible

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

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

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

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

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

In addition:

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

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

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

# 1 Scope

The present document is a technical report for Dual Connectivity of 2 bands LTE inter-band CA (2DL/1UL) and 1 NR band (1DL/1UL) under Rel-17 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-17 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>".

It is preferred that the reference to 21.905 be the first in the list.

# 3 Definitions of terms, symbols and abbreviations

This clause and its three subclauses are mandatory. The contents shall be shown as "void" if the TS/TR does not define any terms, symbols, or abbreviations.

## 3.1 Terms

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

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

Abbreviation 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-17 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)

| DC  configuration | Uplink 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 DC Configuration | E-UTRA and NR Band | ΔTIB,c [dB] |
| --- | --- | --- |
|  |  |  |
|  |  |
|  |  |

**Table 5.X.3-2: ΔRIB**

| Inter-band DC Configuration | E-UTRA and NR Band | ΔRIB [dB] |
| --- | --- | --- |
|  |  |  |
|  |  |
|  |  |

### 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\_3-19\_n1

### 5.1.1 Configurations for DC

Table 5.1.1-1: Inter-band DC configurations (three bands)

| DC  configuration | Uplink configuration |
| --- | --- |
| DC\_3A-19A\_n1A | DC\_3A\_n1A  DC\_19A\_n1A |

### 5.1.2 Co-existence studies

Based on co-existence studies of DC\_3\_n1 and DC\_19\_n1, own Rx impact of the 3rd band is the followings.

- IMD generated by DC\_3\_n1 uplink doesn’t fall into own Rx of band 19.

- IMD generated by DC\_19\_n1 uplink doesn’t fall into own Rx of band 3.

### 5.1.3 ∆TIB and ∆RIB values

For DC\_3-19\_n1, the ΔTIB,c and ΔRIB,c values are reused from the LTE combination CA\_1-3-19, and are given in the tables below.

Table 5.1.3-1: ΔTIB,c

| Inter-band DC Configuration | E-UTRA and NR Band | ΔTIB,c [dB] |
| --- | --- | --- |
| DC\_3-19\_n1 | 3 | 0.3 |
| 19 | 0.3 |
| n1 | 0.3 |

**Table 5.1.3-2: ΔRIB**

| Inter-band DC Configuration | E-UTRA and NR Band | ΔRIB [dB] |
| --- | --- | --- |
| DC\_3-19\_n1 | 3 | 0 |
| 19 | 0 |
| n1 | 0 |

### 5.1.4 Reference sensitivity exceptions

There is no additional MSD requirement for this configuration.

## 5.2 DC\_3-21\_n1

### 5.2.1 Configurations for DC

Table 5.2.1-1: Inter-band DC configurations (three bands)

| DC  configuration | Uplink configuration |
| --- | --- |
| DC\_3A-21A\_n1AX1,X2 | DC\_3A\_n1A  DC\_21A\_n1A |
| NOTE X1: The frequency range in band n1 is restricted for this band combination to 1940 - 1960 MHz for the UL and 2130-2150 MHz for the DL.  NOTE X2: The frequency range in band 3 is restricted for this band combination to 1765 - 1785 MHz for the UL and 1860-1880 MHz for the DL. | |

### 5.2.2 Co-existence studies

Based on co-existence studies of DC\_3\_n1 and DC\_21\_n1, own Rx impact of the 3rd band is the followings.

- 3rd order IMD products generated by DC\_3\_n1 uplink may fall into own Rx of band 21.

- 5th order IMD products generated by DC\_3\_n1 uplink may fall into own Rx of band 21.

- IMD generated by DC\_21\_n1 uplink doesn’t fall into own Rx of band 3.

### 5.2.3 ∆TIB and ∆RIB values

For DC\_3-21\_n1, the ΔTIB,c and ΔRIB,c values are reused from the LTE combination CA\_1-3-21, and are given in the tables below.

Table 5.2.3-1: ΔTIB,c

| Inter-band DC Configuration | E-UTRA and NR Band | ΔTIB,c [dB] |
| --- | --- | --- |
| DC\_3-21\_n1 | 3 | 0.8 |
| 21 | 0.9 |
| n1 | 0.3 |

**Table 5.2.3-2: ΔRIB**

| Inter-band DC Configuration | E-UTRA and NR Band | ΔRIB [dB] |
| --- | --- | --- |
| DC\_3-21\_n1 | 3 | 0.3 |
| 21 | 0.5 |
| n1 | 0 |

### 5.2.4 Reference sensitivity exceptions

When LTE CA 1-3-21 was introduced, IMD was calculated based on the frequency range that the operator actually owned, which resulted in that IMD3 and IMD5 doesn’t fall into own Rx of band 21. Therefore, there is no need to have MSD added. NOTE X1 and NOTE X2 in Table 5.2.1-1 indicate these frequency ranges.

## 5.3 DC\_3-42\_n1

### 5.3.1 Configurations for DC

Table 5.3.1-1: Inter-band DC configurations (three bands)

| DC  configuration | Uplink configuration |
| --- | --- |
| DC\_3A-42A\_n1A | DC\_3A\_n1A  DC\_42A\_n1A |
| DC\_3A-42C\_n1A | DC\_3A\_n1A  DC\_42A\_n1A |

### 5.3.2 Co-existence studies

Based on co-existence studies of DC\_3\_n1 and DC\_42\_n1, own Rx impact of the 3rd band is the followings.

- 4th order IMD products generated by DC\_3\_n1 uplink may fall into own Rx of band 42.

- IMD generated by DC\_42\_n1 uplink doesn’t fall into own Rx of band 3.

### 5.3.3 ∆TIB and ∆RIB values

For DC\_3-42\_n1, the ΔTIB,c and ΔRIB,c values are reused from the LTE combination CA\_1-3-42, and are given in the tables below.

Table 5.3.3-1: ΔTIB,c

| Inter-band DC Configuration | E-UTRA and NR Band | ΔTIB,c [dB] |
| --- | --- | --- |
| DC\_3-42\_n1 | 3 | 0.6 |
| 42 | 0.8 |
| n1 | 0.6 |

**Table 5.3.3-2: ΔRIB**

| Inter-band DC Configuration | E-UTRA and NR Band | ΔRIB [dB] |
| --- | --- | --- |
| DC\_3-42\_n1 | 3 | 0.2 |
| 42 | 0.5 |
| n1 | 0.2 |

### 5.3.4 Reference sensitivity exceptions

As mentioned above, IMD4 of B3 and n1 to Band 42 Rx need to be addressed for REFSENS relaxation. For DC\_3-42\_n1, REFSENS exceptions are reused from the LTE combination CA\_1-3-42, and are given in the tables below.

Table 5.3.4-1: MSD test points for Scell due to dual uplink operation for EN-DC in NR FR1

| NR or E-UTRA Band / Channel bandwidth / NRB / MSD | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- |
| EN-DC Configuration | EUTRA / NR band | UL Fc  (MHz) | UL/DL BW  (MHz) | UL  LCRB | DL Fc (MHz) | MSD  (dB) | IMD order |
| DC\_3A-42A\_n1A  DC\_3A-42C\_n1A | 3 | 1782.5 | 5 | 25 | 1877.5 | N/A | N/A |
| 42 | 3425 | 5 | 25 | 3425 | 13.0 | IMD4 |
| n1 | 1922.5 | 5 | 25 | 2112.5 | N/A | N/A |

## 5.4 DC\_19-21\_n1

### 5.4.1 Configurations for DC

Table 5.4.1-1: Inter-band DC configurations (three bands)

| DC  configuration | Uplink configuration |
| --- | --- |
| DC\_19A-21A\_n1A | DC\_19A\_n1A  DC\_21A\_n1A |

### 5.4.2 Co-existence studies

Based on co-existence studies of DC\_19\_n1 and DC\_21\_n1, own Rx impact of the 3rd band is the followings.

- IMD generated by DC\_19\_n1 uplink doesn’t fall into own Rx of band 21.

- IMD generated by DC\_21\_n1 uplink doesn’t fall into own Rx of band 19.

### 5.4.3 ∆TIB and ∆RIB values

For DC\_19-21\_n1, the ΔTIB,c and ΔRIB,c values are reused from the LTE combination CA\_1-19-21, and are given in the tables below.

Table 5.4.3-1: ΔTIB,c

| Inter-band DC Configuration | E-UTRA and NR Band | ΔTIB,c [dB] |
| --- | --- | --- |
| DC\_19-21\_n1 | 19 | 0.3 |
| 21 | 0.4 |
| n1 | 0.3 |

**Table 5.4.3-2: ΔRIB**

| Inter-band DC Configuration | E-UTRA and NR Band | ΔRIB [dB] |
| --- | --- | --- |
| DC\_19-21\_n1 | 19 | 0 |
| 21 | 0 |
| n1 | 0 |

### 5.4.4 Reference sensitivity exceptions

There is no additional MSD requirement for this configuration.

## 5.5 DC\_19-42\_n1

### 5.5.1 Configurations for DC

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

| DC  configuration | Uplink configuration |
| --- | --- |
| DC\_19A-42A\_n1AX1,X3 | DC\_19A\_n1A  DC\_42A\_n1A |
| DC\_19A-42C\_n1 AX1,X3 | DC\_19A\_n1A  DC\_42A\_n1A |
| NOTE X1: The frequency range in band n1 is restricted for this band combination to 1940 - 1960 MHz for the UL and 2130-2150 MHz for the DL.  NOTE X3: The frequency range in band 42 is restricted for this band combination to 3440 - 3520 MHz. | |

### 5.5.2 Co-existence studies

Based on co-existence studies of DC\_19\_n1 and DC\_42\_n1, own Rx impact of the 3rd band is the followings.

- 3rd order IMD products generated by DC\_19\_n1 uplink may fall into own Rx of band 42.

- 5th order IMD products generated by DC\_42\_n1 uplink may fall into own Rx of band 19.

### 5.5.3 ∆TIB and ∆RIB values

For DC\_19-42\_n1, the ΔTIB,c and ΔRIB,c values are reused from the LTE combination CA\_1-19-42, and are given in the tables below.

Table 5.5.3-1: ΔTIB,c

| Inter-band DC Configuration | E-UTRA and NR Band | ΔTIB,c [dB] |
| --- | --- | --- |
| DC\_19-42\_n1 | 19 | 0.3 |
| 42 | 0.8 |
| n1 | 0.3 |

**Table 5.5.3-2: ΔRIB**

| Inter-band DC Configuration | E-UTRA and NR Band | ΔRIB [dB] |
| --- | --- | --- |
| DC\_19-42\_n1 | 19 | 0 |
| 42 | 0.5 |
| n1 | 0 |

### 5.5.4 Reference sensitivity exceptions

When LTE CA 1-19-42 was introduced, IMD was calculated based on the frequency range that the operator actually owned, which resulted in that IMD3 doesn’t fall into own Rx of band 42 and IMD5 doesn’t fall into own Rx of band 19. Therefore, there is no need to have MSD added. NOTE X1 and NOTE X3 in Table 5.5.1-1 indicate these frequency ranges.

## 5.6 DC\_21-42\_n1

### 5.6.1 Configurations for DC

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

| DC  configuration | Uplink configuration |
| --- | --- |
| DC\_21A-42A\_n1AX1,X3 | DC\_21A\_n1A  DC\_42A\_n1A |
| DC\_21A-42C\_n1 AX1,X3 | DC\_21A\_n1A  DC\_42A\_n1A |
| NOTE X1: The frequency range in band n1 is restricted for this band combination to 1940 - 1960 MHz for the UL and 2130-2150 MHz for the DL.  NOTE X3: The frequency range in band 42 is restricted for this band combination to 3440 - 3520 MHz. | |

### 5.6.2 Co-existence studies

Based on co-existence studies of DC\_21\_n1 and DC\_42\_n1, own Rx impact of the 3rd band is the followings.

- 2nd order IMD products generated by DC\_21\_n1 uplink may fall into own Rx of band 42.

- 2nd order IMD products generated by DC\_42\_n1 uplink may fall into own Rx of band 21.

### 5.6.3 ∆TIB and ∆RIB values

For DC\_21-42\_n1, the ΔTIB,c and ΔRIB,c values are reused from the LTE combination CA\_1-21-42, and are given in the tables below.

Table 5.6.3-1: ΔTIB,c

| Inter-band DC Configuration | E-UTRA and NR Band | ΔTIB,c [dB] |
| --- | --- | --- |
| DC\_21-42\_n1 | 21 | 0.4 |
| 42 | 0.8 |
| n1 | 0.3 |

**Table 5.6.3-2: ΔRIB**

| Inter-band DC Configuration | E-UTRA and NR Band | ΔRIB [dB] |
| --- | --- | --- |
| DC\_21-42\_n1 | 21 | 0 |
| 42 | 0.5 |
| n1 | 0 |

### 5.6.4 Reference sensitivity exceptions

When LTE CA 1-21-42 was introduced, IMD was calculated based on the frequency range that the operator actually owned, which resulted in that IMD2 doesn’t fall into own Rx of band 42. Therefore, we didn’t specify MSD for band 42. NOTE X1 and NOTE X3 in Table 5.6.1-1 indicate these frequency ranges.

IMD2 of B42 and n1 to Band 21 Rx need to be addressed for REFSENS relaxation. For DC\_21-42\_n1, REFSENS exceptions are reused from DC\_1-11\_n78, already defined in TS 38.101-3, due to similarity in frequency range.

Table 5.6.4-1: MSD test points for Scell due to dual uplink operation for EN-DC in NR FR1

| NR or E-UTRA Band / Channel bandwidth / NRB / MSD | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- |
| EN-DC Configuration | EUTRA / NR band | UL Fc  (MHz) | UL/DL BW  (MHz) | UL  LCRB | DL Fc (MHz) | MSD  (dB) | IMD order |
| DC\_21A-42A\_n1A | 21 | 1452 | 5 | 25 | 1500 | 31.4 | IMD2 |
| 42 | 3450 | 10 | 50 | 3450 | N/A | N/A |
| n1 | 1950 | 5 | 25 | 2140 | N/A | N/A |

## 5.7 DC\_1-32\_n28

### 5.7.1 Configurations for DC

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

| DC  configuration | Uplink configuration |
| --- | --- |
| DC\_1A-32A\_n28A | DC\_1A\_n28A |

### 5.7.2 Co-existence studies

Table 5.7.2-1 lists the Band 1A + Band n28A 2UL DC 2nd and 3rd order harmonics and 2nd, 3rd, 4th and 5th order IMD for the UE-to-UE coexistence analysis.

Table 5.7.2-1: Band 1 and Band n28 UL harmonics and IMD products

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **UE UL carriers** | **fx\_low** | **fx\_high** | | **fn\_low** | **fn\_high** | |
| UL frequency (MHz) | 1920 | 1980 | | 703 | 748 | |
| 2nd harmonics frequency limits | 2\*fx\_low | 2\*fx\_high | | 2\* fn\_low | 2\* fn\_high | |
| 2nd harmonics frequency limits (MHz) | 3840 – 3960 | | | 1406 – 1496 | | |
| 3rd harmonics frequency limits | 3\*fx\_low | | 3\*fx\_high | 3\* fn\_low | | 3\* fn\_high |
| 3rd harmonics frequency limits (MHz) | 5760 – 5940 | | | 2109 – 2244 | | |
| 2nd order IMD products | |fn\_low – fx\_high| | |fn\_high – fx\_low| | | |fn\_low + fx\_low| | |fn\_high + fx\_high| | |
| IMD frequency limits (MHz) | 1172 – 1277 | | | 2623 – 2728 | | |
| 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) | 3092 – 3257 | | | 424 – 574 | | |
| 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) | 4543 – 4708 | | | 3326 – 3476 | | |
| 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) | 1890 – 2010 | | | 683 – 768 | | |
| 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) | 5012 – 5237 | | | 129 – 324 | | |
| Two-tone 4th order IMD products | |2\*fx\_low –2\* fn\_high| | | |2\*fx\_high –2\* fn\_low| |  | |  |
| IMD frequency limits (MHz) | 2344 – 2554 | | |  | | |
| 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) | 6463 – 6688 | | | 4029 – 4224 | | |
| Two-tone 4th order IMD products | |2\*fx\_low +2\* fn\_low| | | |2\*fx\_high +2\* fn\_high| |  | |  |
| IMD frequency limits (MHz) | 5246 – 5456 | | |  | | |
| 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) | 832 – 1072 | | | 6932 – 7217 | | |
| 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) | 1596 – 1851 | | | 4264 – 4534 | | |
| 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) | 4732 – 4972 | | | 8383 – 8668 | | |
| 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) | 5949 – 6204 | | | 7166 – 7436 | | |

Based on Table 5.7.2-1,

- 2nd order harmonics may fall into the Rx of bands 11, 21, 32, 45, 46, 47, 75 and 76

- 3rd order harmonics may fall into the Rx frequencies of bands 1, 4, 10, 23, 65, 66 and 77

- 2nd order IMD may fall into Rx frequencies of bands 7 and 41

- 3rd order IMD may fall into Rx frequencies of bands 31, 42 and 77

- 4th order IMD may fall into Rx of bands 30, 40, 41, 46, 46 and 77

- 5th order IMD may fall into Rx frequencies of bands 3, 5, 6, 8, 9, 18, 19, 26, 27 and 35

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 5.7.2-2 lists if up to 3rd order harmonics and IMD up to 5th order falls into one of these receiving bands.

Table 5.7.2-2: 2UL Band 1 + Band n28 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 | Yes |  | IMD 5 |
| GPS | 1563 | - | 1587 | No |  |  |
| ISM band  (2.4GHz) | 2400 | - | 2483.5 | Yes | US/Europe | IMD4 |
| 2400 | - | 2494 | Yes | Asia | IMD4 |
| ISM band  (5GHz) | 5150 | - | 5925 | Yes | US | Harmonic 3, IMD 4 |
| 5150 | - | 5350 | Yes | Europe | IMD 4 |
| 5470 | - | 5725 | Yes | IMD 4 |
| 5150 | - | 5825 | Yes | Asia | Harmonic 3, IMD 4 |

The requirements for coexistence with protected bands (including band 32) exist for DC\_1A\_n28A in 38101-3.

### 5.7.3 ∆TIB and ∆RIB values

Table 5.7.3-1: ΔTIB,c

| Inter-band DC Configuration | E-UTRA and NR Band | ΔTIB,c [dB] |
| --- | --- | --- |
| DC\_1A-32A\_n28 | 1 | 0.3 |
| n28 | 0.7 |

**Table 5.7.3-2: ΔRIB**

| Inter-band DC Configuration | E-UTRA and NR Band | ΔRIB [dB] |
| --- | --- | --- |
| DC\_1A-32A\_n28 | 1 | 0 |
| 32 | 0 |
| n28 | 0.2 |

### 5.7.4 Reference sensitivity exceptions

No additional exceptions for IMD are required.

### 5.7.5 Reference sensitivity exceptions due to UL harmonic interference for EN-DC in NR FR1

The entries in tables 5.7.5-1 and 5.7.5-2 are to be added to TS38101-3 tables 7.3B.2.3.1-1 and 7.3B.2.3.1-2 respectively.

**Table 5.7.5-1: Reference sensitivity exceptions (MSD) due to UL harmonic for EN-DC in NR FR1**

| E-UTRA or NR Band / Channel bandwidth of the affected DL band / MSD | | | | | | | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| UL band | DL band | 5 MHz  (dB) | 10 MHz  (dB) | 15 MHz  (dB) | 20 MHz  (dB) | 25 MHz  (dB) | 30 MHz (dB) | 40 MHz  (dB) | 50 MHz  (dB) | 60 MHz  (dB) | 80 MHz  (dB) | 90 MHz  (dB) | 100 MHz  (dB) |
| n28 | 32 | 28.1 | 25.3 | 24.0 | 22.8 |  |  |  |  |  |  |  |  |

**Table 5.7.5-2: Uplink configuration for reference sensitivity exceptions due to UL harmonic interference for EN-DC in NR FR1**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| E-UTRA or NR Band / Channel bandwidth of the affected DL band / UL RB allocation of the aggressor band | | | | | | | | | | | | | |
| UL band | DL band | 5  MHz  (LCRB) | 10 MHz  (LCRB) | 15 MHz  (LCRB) | 20 MHz  (LCRB) | 25 MHz  (LCRB) | 30 MHz  (LCRB) | 40 MHz  (LCRB) | 50 MHz  (LCRB) | 60 MHz  (LCRB) | 80 MHz  (LCRB) | 90 MHz  (LCRB) | 100 MHz  (LCRB) |
| n28 | 32 | 8 | 16 | 25 | 25 |  |  |  |  |  |  |  |  |

## 5.8 DC\_7-32\_n28

### 5.8.1 Configurations for DC

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

| DC  configuration | Uplink configuration |
| --- | --- |
| DC\_7A-32A\_n28A | DC\_7A\_n28A |

### 5.8.2 Co-existence studies

Table 5.8.2-1 lists the Band 7A + Band n28A 2UL DC 2nd and 3rd order harmonics and 2nd, 3rd, 4th and 5th order IMD for the UE-to-UE coexistence analysis.

Table 5.8.2-1: Band 7 and Band n28 UL harmonics and IMD products

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **UE UL carriers** | **fx\_low** | **fx\_high** | | **fn\_low** | **fn\_high** | |
| UL frequency (MHz) | 2500 | 2570 | | 703 | 748 | |
| 2nd harmonics frequency limits | 2\*fx\_low | 2\*fx\_high | | 2\* fn\_low | 2\* fn\_high | |
| 2nd harmonics frequency limits (MHz) | 5000 – 5140 | | | 1406 – 1496 | | |
| 3rd harmonics frequency limits | 3\*fx\_low | | 3\*fx\_high | 3\* fn\_low | | 3\* fn\_high |
| 3rd harmonics frequency limits (MHz) | 7500 – 5940 | | | 2109 – 2244 | | |
| 2nd order IMD products | |fn\_low – fx\_high| | |fn\_high – fx\_low| | | |fn\_low + fx\_low| | |fn\_high + fx\_high| | |
| IMD frequency limits (MHz) | 1752 – 1867 | | | 3203 – 3318 | | |
| 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) | 4252 – 4437 | | | 1074 – 1164 | | |
| 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) | 5703 – 5888 | | | 3906 – 4066 | | |
| 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) | 2470 – 2600 | | | 683 – 768 | | |
| 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) | 6752 – 7007 | | | 256 – 461 | | |
| Two-tone 4th order IMD products | |2\*fx\_low –2\* fn\_high| | | |2\*fx\_high –2\* fn\_low| |  | |  |
| IMD frequency limits (MHz) | 3504 – 3734 | | |  | | |
| 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) | 8203 – 8458 | | | 4029 – 4224 | | |
| Two-tone 4th order IMD products | |2\*fx\_low +2\* fn\_low| | | |2\*fx\_high +2\* fn\_high| |  | |  |
| IMD frequency limits (MHz) | 6406 – 6636 | | |  | | |
| 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) | 242 – 492 | | | 6932 – 7217 | | |
| 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) | 2756 – 3031 | | | 4264 – 4534 | | |
| 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) | 5312 – 5562 | | | 8383 – 8668 | | |
| 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) | 7109 – 7384 | | | 8906 – 9206 | | |

Based on Table 5.8.2-1,

- 2nd order harmonics may fall into Rx frequencies of bands 11, 21, 32, 45, 75 and 76

- 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 bands 3, 9, 35 and 77

- 3rd order IMD may fall into Rx frequencies of bands 46, 47 and 77

- 4th order IMD may fall into Rx frequencies of bands 22, 42, 43, 48 and 77

- 5th order IMD may fall into Rx frequencies of bands 31 and 46

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 5.8.2-2 lists if up to 3rd order harmonics and IMD up to 5th order falls into one of these receiving bands.

Table 5.8.2-2: 2UL Band 7 + Band n28 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 | IMD3 |
| 2400 | - | 2494 | Yes | Asia | IMD3 |
| ISM band  (5GHz) | 5150 | - | 5925 | Yes | US | IMD3, IMD5 |
| 5150 | - | 5350 | Yes | Europe | IMD 5 |
| 5470 | - | 5725 | Yes | IMD3, IMD5 |
| 5150 | - | 5825 | Yes | Asia | IMD3, IMD5 |

The requirements for coexistence with protected bands, excluding band 32, exist for DC\_7A\_n28A in 38101-3.

### 5.8.3 ∆TIB and ∆RIB values

Table 5.8.3-1: ΔTIB,c

| Inter-band DC Configuration | E-UTRA and NR Band | ΔTIB,c [dB] |
| --- | --- | --- |
| DC\_7A-32A\_n28 | 7 | 0.3 |
| n28 | 0.7 |

**Table 5.8.3-2: ΔRIB**

| Inter-band DC Configuration | E-UTRA and NR Band | ΔRIB [dB] |
| --- | --- | --- |
| DC\_7A-32A\_n28 | 7 | 0 |
| 32 | 0 |
| n28 | 0.2 |

### 5.8.4 Reference sensitivity exceptions

No additional exceptions for IMD are required.

### 5.8.5 Reference sensitivity exceptions due to UL harmonic interference for EN-DC in NR FR1

The entries in tables 5.8.5-1 and 5.8.5-2 are to be added to TS38101-3 tables 7.3B.2.3.1-1 and 7.3B.2.3.1-2 respectively.

**Table 5.8.5-1: Reference sensitivity exceptions (MSD) due to UL harmonic for EN-DC in NR FR1**

| E-UTRA or NR Band / Channel bandwidth of the affected DL band / MSD | | | | | | | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| UL band | DL band | 5 MHz  (dB) | 10 MHz  (dB) | 15 MHz  (dB) | 20 MHz  (dB) | 25 MHz  (dB) | 30 MHz (dB) | 40 MHz  (dB) | 50 MHz  (dB) | 60 MHz  (dB) | 80 MHz  (dB) | 90 MHz  (dB) | 100 MHz  (dB) |
| n28 | 32 | 28.1 | 25.3 | 24.0 | 22.8 |  |  |  |  |  |  |  |  |

**Table 5.8.5-2: Uplink configuration for reference sensitivity exceptions due to UL harmonic interference for EN-DC in NR FR1**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| E-UTRA or NR Band / Channel bandwidth of the affected DL band / UL RB allocation of the aggressor band | | | | | | | | | | | | | |
| UL band | DL band | 5  MHz  (LCRB) | 10 MHz  (LCRB) | 15 MHz  (LCRB) | 20 MHz  (LCRB) | 25 MHz  (LCRB) | 30 MHz  (LCRB) | 40 MHz  (LCRB) | 50 MHz  (LCRB) | 60 MHz  (LCRB) | 80 MHz  (LCRB) | 90 MHz  (LCRB) | 100 MHz  (LCRB) |
| n28 | 32 | 8 | 16 | 25 | 25 |  |  |  |  |  |  |  |  |

## 5.9 DC\_7-32\_n78

### 5.9.1 Configurations for DC

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

| DC  configuration | Uplink configuration |
| --- | --- |
| DC\_7A-32A\_n78A | DC\_7A\_n78A |

### 5.9.2 Co-existence studies

Table 5.9.2-1 list the Band 7A + 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 5.9.2-1: Band 7 and Band n78 UL harmonics and IMD products

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **UE UL carriers** | **fx\_low** | **fx\_high** | | **fn\_low** | **fn\_high** | |
| UL frequency (MHz) | 2500 | 2570 | | 3300 | 3800 | |
| 2nd harmonics frequency limits | 2\*fx\_low | 2\*fx\_high | | 2\* fn\_low | 2\* fn\_high | |
| 2nd harmonics frequency limits (MHz) | 5000 – 5140 | | | 6600 – 7600 | | |
| 3rd harmonics frequency limits | 3\*fx\_low | | 3\*fx\_high | 3\* fn\_low | | 3\* fn\_high |
| 3rd harmonics frequency limits (MHz) | 7500 – 7710 | | | 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) | 730 – 1300 | | | 5800 – 6370 | | |
| 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) | 1200 – 1840 | | | 4030 – 5030 | | |
| 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) | 8300 – 8940 | | | 9100 – 10170 | | |
| 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) | 2400 – 2670 | | | 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) | 3700 – 4410 | | | 7330 – 8900 | | |
| Two-tone 4th order IMD products | |2\*fx\_low –2\* fn\_high| | | |2\*fx\_high –2\* fn\_low| |  | |  |
| IMD frequency limits (MHz) | 1460 – 2600 | | |  | | |
| 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) | 10800 – 11510 | | | 4029 – 4224 | | |
| Two-tone 4th order IMD products | |2\*fx\_low +2\* fn\_low| | | |2\*fx\_high +2\* fn\_high| |  | |  |
| IMD frequency limits (MHz) | 11600 – 12740 | | |  | | |
| 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) | 10630 – 12700 | | | 6932 – 7217 | | |
| 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) | 4760 – 6400 | | | 4264 – 4534 | | |
| 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) | 15700 – 17770 | | | 8383 – 8668 | | |
| 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) | 14900 – 16540 | | | 14100 – 15310 | | |

Based on Table 5.9.2-1,

- 2nd order IMD may fall into Rx frequencies of bands 5, 6, 8, 12, 13, 14, 17, 18, 19, 20, 26, 27, 28, 44, 46, 47, 67 and 68

- 3rd order IMD may fall into Rx frequencies of bands 3, 11, 21, 24, 32, 45, 75, 76 and 77

- 4th order IMD may fall into Rx frequencies of bands 1, 2, 3, 4, 9, 10, 11, 21, 23, 24, 25, 30, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 43, 45, 65, 66, 69, 70, 75 and 77

- 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, 47, 67 and 68

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 5.9.2-2 lists if up to 3rd order harmonics and IMD up to 5th order falls into one of these receiving bands.

Table 5.9.2-2: 2UL Band 7 + Band n78 harmonic and IMD for ISM and GNSS bands

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Victim Systems** | **Frequency range [MHz]** | | | **Impact** | **Regions** | **Comments** |
| COMPASS  (Beidou) | 1559 | - | 1591 | Yes |  | IMD3, IMD4 |
| Galileo | 1559 | - | 1591 | Yes |  | IMD3, IMD4 |
| GLONASS | 1591 | - | 1610 | Yes |  | IMD3, IMD4 |
| GPS | 1563 | - | 1587 | Yes |  | IMD3, IMD4 |
| ISM band  (2.4GHz) | 2400 | - | 2483.5 | Yes | US/Europe | IMD3, IMD4 |
| 2400 | - | 2494 | Yes | Asia | IMD3, IMD4 |
| ISM band  (5GHz) | 5150 | - | 5925 | Yes | US | IMD3, IMD5 |
| 5150 | - | 5350 | Yes | Europe | IMD5 |
| 5470 | - | 5725 | Yes | IMD5 |
| 5150 | - | 5825 | Yes | Asia | IMD2, IMD5 |

The requirements for coexistence with protected bands (including band 32) exist for DC\_7A\_n78A in 38101-3.

### 5.9.3 ∆TIB and ∆RIB values

Table 5.9.3-1: ΔTIB,c

| Inter-band DC Configuration | E-UTRA and NR Band | ΔTIB,c [dB] |
| --- | --- | --- |
| DC\_7A-32A\_n78 | 7 | 0.5 |
| n78 | 0.8 |

**Table 5.9.3-2: ΔRIB**

| Inter-band DC Configuration | E-UTRA and NR Band | ΔRIB [dB] |
| --- | --- | --- |
| DC\_7A-32A\_n78 | 7 | 0 |
| 32 | 0 |
| n78 | 0.5 |

### 5.9.4 Reference sensitivity exceptions

**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-32A\_n78A | n78 | 3560.5 | 10 | 50 | 3560.5 | N/A | N/A |
| 7 | 2517.5 | 5 | 25 | 2637.5 | N/A | N/A |
| 32 | N/A | 5 | N/A | 1474.5 | 17.6 | IMD3 |
| n78 | 3311 | 10 | 50 | 3311 | N/A | N/A |
| 7 | 2565 | 5 | 25 | 2685 | N/A | N/A |
| 32 | N/A | 5 | N/A | 1492 | 4.9 | IMD4 |

## 5.10 DC\_20-32\_n28

### 5.10.1 Configurations for DC

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

| DC  configuration | Uplink configuration |
| --- | --- |
| DC\_20A-32A\_n28A | DC\_20A\_n28A |

### 5.10.2 Co-existence studies

Table 5.10.2-1 lists the Band 20A + Band n28A 2UL DC 2nd and 3rd order harmonics and 2nd, 3rd, 4th and 5th order IMD for the UE-to-UE coexistence analysis.

Table 5.10.2-1: Band 20 and Band n28 UL harmonics and IMD products

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **UE UL carriers** | **fx\_low** | **fx\_high** | | **fn\_low** | **fn\_high** | |
| UL frequency (MHz) | 832 | 862 | | 703 | 748 | |
| 2nd harmonics frequency limits | 2\*fx\_low | 2\*fx\_high | | 2\* fn\_low | 2\* fn\_high | |
| 2nd harmonics frequency limits (MHz) | 1664 – 1724 | | | 1406 – 1496 | | |
| 3rd harmonics frequency limits | 3\*fx\_low | | 3\*fx\_high | 3\* fn\_low | | 3\* fn\_high |
| 3rd harmonics frequency limits (MHz) | 2496 – 2586 | | | 2109 – 2244 | | |
| 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) | 916 – 1021 | | | 544 – 634 | | |
| 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) | 2367 – 2472 | | | 2238 – 2358 | | |
| 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 | | | 703 – 748 | | |
| 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) | 1748 – 1883 | | | 1247 – 1412 | | |
| Two-tone 4th order IMD products | |2\*fx\_low –2\* fn\_high| | | |2\*fx\_high –2\* fn\_low| |  | |  |
| IMD frequency limits (MHz) | 168 – 318 | | |  | | |
| 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) | 3199 – 3334 | | | 4029 – 4224 | | |
| Two-tone 4th order IMD products | |2\*fx\_low +2\* fn\_low| | | |2\*fx\_high +2\* fn\_high| |  | |  |
| IMD frequency limits (MHz) | 3070 – 3220 | | |  | | |
| 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) | 1950 – 2160 | | | 6932 – 7217 | | |
| 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) | 385 – 580 | | | 4264 – 4534 | | |
| 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) | 3644 – 3854 | | | 8383 – 8668 | | |
| 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) | 3773 – 3968 | | | 3902 – 4082 | | |

Based on Table 5.10.2-1,

- 2nd order harmonics may fall into Rx frequencies of bands 11, 21, 32, 38, 41, 45, 69, 75 and 76

- 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 and 40

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

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

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 5.10.2-2 lists if up to 3rd order harmonics and IMD up to 5th order falls into one of these receiving bands.

Table 5.10.2-2: 2UL Band 20 + Band n28 harmonic and IMD for ISM and GNSS bands

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

The requirements for coexistence with protected bands (including band 32) exist for DC\_20A\_n28A in 38101-3.

### 5.10.3 ∆TIB and ∆RIB values

Table 5.10.3-1: ΔTIB,c

| Inter-band DC Configuration | E-UTRA and NR Band | ΔTIB,c [dB] |
| --- | --- | --- |
| DC\_20A-32A\_n28 | 20 | 0.5 |
| n28 | 0.7 |

**Table 5.10.3-2: ΔRIB**

| Inter-band DC Configuration | E-UTRA and NR Band | ΔRIB [dB] |
| --- | --- | --- |
| DC\_20A-32A\_n28 | 20 | 0 |
| 32 | 0 |
| n28 | 0.2 |

### 5.10.4 Reference sensitivity exceptions

No additional exceptions for IMD are required.

### 5.10.5 Reference sensitivity exceptions due to UL harmonic interference for EN-DC in NR FR1

The entries in tables 5.10.5-1 and 5.10.5-2 are to be added to TS38101-3 tables 7.3B.2.3.1-1 and 7.3B.2.3.1-2 respectively.

**Table 5.10.5-1: Reference sensitivity exceptions (MSD) due to UL harmonic for EN-DC in NR FR1**

| E-UTRA or NR Band / Channel bandwidth of the affected DL band / MSD | | | | | | | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| UL band | DL band | 5 MHz  (dB) | 10 MHz  (dB) | 15 MHz  (dB) | 20 MHz  (dB) | 25 MHz  (dB) | 30 MHz (dB) | 40 MHz  (dB) | 50 MHz  (dB) | 60 MHz  (dB) | 80 MHz  (dB) | 90 MHz  (dB) | 100 MHz  (dB) |
| n28 | 32 | 28.1 | 25.3 | 24.0 | 22.8 |  |  |  |  |  |  |  |  |

**Table 5.10.5-2: Uplink configuration for reference sensitivity exceptions due to UL harmonic interference for EN-DC in NR FR1**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| E-UTRA or NR Band / Channel bandwidth of the affected DL band / UL RB allocation of the aggressor band | | | | | | | | | | | | | |
| UL band | DL band | 5  MHz  (LCRB) | 10 MHz  (LCRB) | 15 MHz  (LCRB) | 20 MHz  (LCRB) | 25 MHz  (LCRB) | 30 MHz  (LCRB) | 40 MHz  (LCRB) | 50 MHz  (LCRB) | 60 MHz  (LCRB) | 80 MHz  (LCRB) | 90 MHz  (LCRB) | 100 MHz  (LCRB) |
| n28 | 32 | 8 | 16 | 25 | 25 |  |  |  |  |  |  |  |  |

## 5.11 DC\_2-48\_n5

### 5.11.1 Configurations for DC

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

| DC  configuration | Uplink configuration |
| --- | --- |
| DC\_2A-48A\_n5A | DC\_2A\_n5A  DC\_48A\_n5A |

### 5.11.2 Co-existence studies

When uplink is DC\_2A\_n5A there is IMD3 interfering band 48 downlink.

When uplink is DC\_48A\_n5A there is IMD3 interfering band 2 downlink.

### 5.11.3 ∆TIB and ∆RIB values

It is proposed to take the maximum relaxation values from DC\_2-n5 and DC\_48-n5.

Table 5.11.3-1: ΔTIB,c

| Inter-band DC Configuration | E-UTRA and NR Band | ΔTIB,c [dB] |
| --- | --- | --- |
| DC\_2-48\_n5 | 2 | 0.6 |
| 48 | 0.8 |
| n5 | 0.3 |

**Table 5.11.3-2: ΔRIB**

| Inter-band DC Configuration | E-UTRA and NR Band | ΔRIB [dB] |
| --- | --- | --- |
| DC\_2-48\_n5 | 2 | 0.2 |
| 48 | 0.5 |
| n5 | 0.0 |

### 5.11.4 Reference sensitivity exceptions

The MSD levels are derived from the text proposal in R4-2010232 and R4-2014135.

| 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-48A\_n5A | 2 | 1870 | 5 | 25 | 1950 | 16.9 | IMD3 |
| 48 | 3610 | 10 | 50 | 3610 | N/A | N/A |
| n5 | 830 | 5 | 25 | 875 | N/A | N/A |
| 2 | 1890 | 5 | 25 | 1970 | N/A | N/A |
| 48 | 3570 | 5 | 25 | 3570 | 16.2 | IMD3 |
| n5 | 840 | 5 | 25 | 885 | N/A | N/A |

## 5.12 DC\_5-48\_n12

### 5.12.1 Configurations for DC

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

| DC  configuration | Uplink configuration |
| --- | --- |
| DC\_5A-48A\_n12A | DC\_5A\_n12A  DC\_48A\_n12A |

### 5.12.2 Co-existence studies

When uplink is DC\_5A\_n12A there is IMD5 interfering band 48 downlink.

When uplink is DC\_48A\_n12A there is IMD5 interfering band 5 downlink.

### 5.12.3 ∆TIB and ∆RIB values

It is proposed to re-use relaxation values from E-UTRA CA\_5-12-48.

Table 5.12.3-1: ΔTIB,c

| Inter-band DC Configuration | E-UTRA and NR Band | ΔTIB,c [dB] |
| --- | --- | --- |
| DC\_5-48\_n12 | 5 | 0.8 |
| 48 | 0.3 |
| n12 | 0.4 |

**Table 5.12.3-2: ΔRIB**

| Inter-band DC Configuration | E-UTRA and NR Band | ΔRIB [dB] |
| --- | --- | --- |
| DC\_5-48\_n12 | 5 | 0.5 |
| 48 | 0 |
| n12 | 0.3 |

### 5.12.4 Reference sensitivity exceptions

It is prosed to re-use the IMD5 MSD values from already specified configuration DC\_7A-28A\_n5A which is similar to DC\_5A-48A\_n12A.

| 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-48A\_n12A | 5 | 830 | 5 | 25 | 875 | N/A | N/A |
| 48 | 3650 | 5 | 25 | 3650 | 4.4 | IMD5 |
| n12 | 705 | 5 | 25 | 735 | N/A | N/A |
| 5 | 830 | 5 | 25 | 875 | 5.9 | IMD5 |
| 48 | 3695 | 5 | 25 | 3695 | N/A | N/A |
| n12 | 705 | 5 | 25 | 735 | N/A | N/A |

## 5.13 DC\_5-48\_n71

### 5.13.1 Configurations for DC

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

| DC  configuration | Uplink configuration |
| --- | --- |
| DC\_5A-48A\_n71A | DC\_5A\_n71A  DC\_48A\_n71A |

### 5.13.2 Co-existence studies

When uplink is DC\_5A\_n71A there is IMD5 interfering band 48 downlink.

When uplink is DC\_48A\_n71A there is IMD5 interfering band 5 downlink.

### 5.13.3 ∆TIB and ∆RIB values

It is proposed to take the maximum relaxation values from DC\_5\_n71 and DC\_48\_n71.

Table 5.13.3-1: ΔTIB,c

| Inter-band DC Configuration | E-UTRA and NR Band | ΔTIB,c [dB] |
| --- | --- | --- |
| DC\_5-48\_n71 | 5 | 0.5 |
| 48 | 0.3 |
| n71 | 0.5 |

**Table 5.13.3-2: ΔRIB**

| Inter-band DC Configuration | E-UTRA and NR Band | ΔRIB [dB] |
| --- | --- | --- |
| DC\_5-48\_n71 | 5 | 0 |
| 48 | 0 |
| n71 | 0 |

### 5.13.4 Reference sensitivity exceptions

It is prosed to re-use the IMD5 MSD values from already specified configuration DC\_7A-28A\_n5A which is similar to DC\_5A-48A\_n71A.

| 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-48A\_n71A | 5 | 830 | 5 | 25 | 875 | N/A | N/A |
| 48 | 3590 | 5 | 25 | 3590 | 4.4 | IMD5 |
| n71 | 690 | 5 | 25 | 644 | N/A | N/A |
| 5 | 835 | 5 | 25 | 880 | 5.9 | IMD5 |
| 48 | 3600 | 5 | 25 | 3600 | N/A | N/A |
| n71 | 680 | 5 | 25 | 634 | N/A | N/A |

## 5.14 DC\_12-48\_n5

### 5.14.1 Configurations for DC

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

| DC  configuration | Uplink configuration |
| --- | --- |
| DC\_12A-48A\_n5A | DC\_12A\_n5A  DC\_48A\_n5A |

### 5.14.2 Co-existence studies

When uplink is DC\_12A\_n5A or DC\_48A\_n5A there is no IMD interfering 3rd band downlink.

### 5.14.3 ∆TIB and ∆RIB values

It is proposed to re-use relaxation values from E-UTRA CA\_5-12-48.

Table 5.14.3-1: ΔTIB,c

| Inter-band DC Configuration | E-UTRA and NR Band | ΔTIB,c [dB] |
| --- | --- | --- |
| DC\_12-48\_n5 | 12 | 0.4 |
| 48 | 0.3 |
| n5 | 0.8 |

**Table 5.14.3-2: ΔRIB**

| Inter-band DC Configuration | E-UTRA and NR Band | ΔRIB [dB] |
| --- | --- | --- |
| DC\_12-48\_n5 | 12 | 0.3 |
| 48 | 0 |
| n5 | 0.5 |

### 5.14.4 Reference sensitivity exceptions

There is no need for additional REFSENS requirement.

## 5.15 DC\_3\_(n)41

### 5.15.1 Configuration for DC

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

| DC configuration | Uplink configuration  (NOTE 1) |
| --- | --- |
| DC\_3A\_(n)41AA | DC\_(n)41AA |

5.15.2 Co-existence study

Coexistence analysis has been captured into TR 37.716-21-11. There is no harmonic or IMD issues for the third band.

### 5.15.3 ∆TIB and ∆RIB values

For DC\_3­\_(n)41AA, the ΔTIB,c and ΔRIB,c values have been defined in TR 37.716-21-11

### 5.15.4 REFSENS requirements

There is no additional requirement for this band combination.

## 5.16 DC\_2A-48A\_n48A

5.16.1 Configurations for DC

Table 5.16.1-1: Inter-band DC configurations (three bands)

| DC  Configuration | Uplink DC  configuration |
| --- | --- |
| DC\_2A-48A\_n48A | DC\_2A\_n48A |

Note that DC\_48\_n48 is not used as uplink configuration.

### 5.16.2 Co-existence studies

Co-existence studies have been performed for lower order combinations. No further analysis is needed.

5.16.3 ∆TIB and ∆RIB values

Table 5.16.3-1: ΔTIB,c

| Inter-band DC configuration | E-UTRA or NR Band | ΔTIB,c (dB) |
| --- | --- | --- |
| DC\_2-48\_n48 | 2 | 0.6 |
| 48 | 0.8 |
| n48 |

Table 5.16.3-2: ΔRIB

| Inter-band DC configuration | E-UTRA or NR Band | ΔRIB,c (dB) |
| --- | --- | --- |
| DC\_2-48\_n48 | 2 | 0.2 |
| 48 | 0.5 |
| n48 |

5.16.4 Reference sensitivity exceptions

REFSENS exceptions needed for DC\_2A-48A\_n48A due to band 48 uplink harmonic into band 2 is already specified in Table 7.3B.2.3.1-1 of TS 38.101-3.

## 5.17 DC\_48-66A\_n25A

5.17.1 Configurations for DC

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

| DC  Configuration | Uplink DC  configuration |
| --- | --- |
| DC\_48A-66A\_n25A  DC\_48C-66A\_n25A  DC\_48D-66A\_n25A | DC\_48A\_n25A  DC\_66A\_n25A |

### 5.17.2 Co-existence studies

Co-existence studies have been performed for lower order combinations.

Co-existence analysis for DC\_48\_n25 UL shows that 4th IMD may fall into NR Band n48 DL. However, since 48 and n48 will be operated as synchronous in same UL/DL configuration there is no IMD problem. Further, a 4th IMD may fall in DL band 66.

Co-existence analysis for DC\_66\_n25 UL shows that 2nd HAM of band 66 may fall into the lowest 10MHz of NR Band n48 DL. This is already covered in Table 7.3B.2.3.1-1 and Table 7.3B.2.3.1-2 in 38.101-3. Further 2nd IMD might also fall in n48 DL

5.17.3 ∆TIB and ∆RIB values

Table 5.17.3-1: ΔTIB,c

| Inter-band DC configuration | E-UTRA or NR Band | ΔTIB,c (dB) |
| --- | --- | --- |
| DC\_48-66\_n25 | 48 | 0.8 |
| 66 | 0.6 |
| n25 | 0.6 |

Table 5.17.3-2: ΔRIB

| Inter-band DC configuration | E-UTRA or NR Band | ΔRIB,c (dB) |
| --- | --- | --- |
| DC\_48-66\_n25 | 48 | 0.5 |
| 66 | 0.2 |
| n25 | 0.2 |

5.17.4 Reference sensitivity exceptions

Based on the co-existence studies for DC\_48\_n25 and DC\_66A\_n25A it is found that MSD it needed.

Table 5.17.4-1: 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\_48A-66A\_n25A  DC\_48C-66A\_n25A  DC\_48D-66A\_n25A | 48 | 3630 | 20 | 100 | 3630 | N/A | N/A |
| 66 | 1730 | 5 | 25 | 2130 | 8.3 | IMD4 |
| n25 | 1883.3 | 5 | 25 | 1963.3 | N/A | N/A |
| 48 | 3620 | 10 | 50 | 3620 | 29.4 | IMD2 |
| 66 | 1740 | 5 | 25 | 2140 | N/A | N/A |
| n25 | 1880 | 5 | 25 | 1960 | N/A | N/A |

## 5.18 DC\_48A-66A\_n48A

5.18.1 Configurations for DC

Table 5.18.2-1: Inter-band DC configurations (three bands)

| DC  Configuration | Uplink DC  configuration |
| --- | --- |
| DC\_48A-66A\_n48A | DC\_66A\_n48A |

Note that DC\_48\_n48 is not used as uplink configuration.

### 5.18.2 Co-existence studies

Co-existence studies have been performed for lower order combinations. No further analysis is needed.

5.18.3 ∆TIB and ∆RIB values

Table 5.18.3-1: ΔTIB,c

| Inter-band DC configuration | E-UTRA or NR Band | ΔTIB,c (dB) |
| --- | --- | --- |
| DC\_48-66\_n48 | 66 | 0.6 |
| 48 | 0.8 |
| n48 |

Table 5.18.3-2: ΔRIB

| Inter-band DC configuration | E-UTRA or NR Band | ΔRIB,c (dB) |
| --- | --- | --- |
| DC\_48-66\_n48 | 66 | 0.2 |
| 48 | 0.5 |
| n48 |

5.18.4 Reference sensitivity exceptions

No REFSENS exceptions needed for DC\_48A-66A\_n48A.

## 5.19 DC\_3-8\_n40

5.19.1 Configurations for DC

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

| DC  Configuration | Uplink DC  configuration |
| --- | --- |
| DC\_3A-8A\_n40A | DC\_3A\_n40A DC\_8A\_n40A |

### 5.19.2 Co-existence studies

Co-existence studies have been performed for lower order combinations. Co-existence analysis for DC\_3\_n40 UL shows no impact to DL band 8,

Co-existence analysis for DC\_8\_n40 UL shows that 5th IMD may fall in DL band 3.

5.19.3 ∆TIB and ∆RIB values

Table 5.19.3-1: ΔTIB,c

| Inter-band DC configuration | E-UTRA or NR Band | ΔTIB,c (dB) |
| --- | --- | --- |
| DC\_3-8\_n40 | 3 | 0.5 |
| 8 | 0.3 |
| n40 | 0.5 |

Table 5.19.3-2: ΔRIB

| Inter-band DC configuration | E-UTRA or NR Band | ΔRIB,c (dB) |
| --- | --- | --- |
| DC\_3-8\_n40 | 3 | 0 |
| 8 | 0 |
| n40 | 0 |

5.19.4 Reference sensitivity exceptions

Based on co-existence studies additional MSD is needed.

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\_3A-8A\_n40A | 3 | 1779 | 5 | 25 | 1874 | 4 | IMD5 |
| 8 | 912 | 5 | 25 | 957 | N/A | N/A |
| n40 | 2305 | 5 | 25 | 2305 | N/A | N/A |

## 5.20 DC\_3-28\_n1

5.20.1 Configurations for DC

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

| DC  Configuration | Uplink DC  configuration |
| --- | --- |
| DC\_3A-28A\_n1A | DC\_28A\_n1A DC\_3A\_n1A |

### 5.20.2 Co-existence studies

Co-existence studies have been performed for lower order combinations. Co-existence analysis for DC\_28\_n1 UL shows that 3rd HAM might fall into DL band n1 This is already covered in Table 7.3B.2.3.1-1 and Table 7.3B.2.3.1-2 in 38.101-3. Further, is shows that 5th IMD may fall in DL band 3.

Co-existence analysis for DC\_3\_n1 UL shows no impact to DL band 28.

5.20.3 ∆TIB and ∆RIB values

Table 5.20.3-1: ΔTIB,c

| Inter-band DC configuration | E-UTRA or NR Band | ΔTIB,c (dB) |
| --- | --- | --- |
| DC\_3-28\_n1 | 3 | 0.3 |
| 28 | 0.6 |
| n1 | 0.3 |

Table 5.20.3-2: ΔRIB

| Inter-band DC configuration | E-UTRA or NR Band | ΔRIB,c (dB) |
| --- | --- | --- |
| DC\_3-28\_n1 | 3 | 0 |
| 28 | 0.2 |
| n1 | 0 |

5.20.4 Reference sensitivity exceptions

REFSENS exceptions needed due to band 28 uplink harmonic into band n1 is already specified for DC\_28A\_n1A.

The reference sensitivity exception (MSD) due to IMD5 for DC\_3-28\_n1 with UL DC\_28\_n1 is specified as below referring to the MSD for CA\_1A-3A-28A from 36.101.

Table 5.20.4-1: 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\_3A-28A\_n1A | 3 | 1725 | 5 | 25 | 1820 | 4 | IMD5 |
| 28 | 710 | 5 | 25 | 765 | N/A | N/A |
| n1 | 1975 | 5 | 25 | 2165 | N/A | N/A |

## 5.21 DC\_7-8\_n40

5.21.1 Configurations for DC

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

| DC  Configuration | Uplink DC  configuration |
| --- | --- |
| DC\_7A-8A\_n40A | DC\_7A\_n40A DC\_8A\_n40A |

### 5.21.2 Co-existence studies

Co-existence studies have been performed for lower order combinations. No further analysis is needed.

5.21.3 ∆TIB and ∆RIB values

Table 5.21.3-1: ΔTIB,c

| Inter-band DC configuration | E-UTRA or NR Band | ΔTIB,c (dB) |
| --- | --- | --- |
| DC\_7-8\_n40 | 7 | 0.5 |
| 8 | 0.6 |
| n40 | 0.6 |

Table 5.21.3-2: ΔRIB

| Inter-band DC configuration | E-UTRA or NR Band | ΔRIB,c (dB) |
| --- | --- | --- |
| DC\_7-8\_n40 | 7 | 0 |
| 8 | 0.2 |
| n40 | 0.5 |

5.21.4 Reference sensitivity exceptions

No further REFSENS exceptions needed.

## 5.22 DC\_7-28\_n1

5.22.1 Configurations for DC

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

| DC  Configuration | Uplink DC  configuration |
| --- | --- |
| DC\_7A-28A\_n1A | DC\_28A\_n1A DC\_7A\_n1A |

### 5.22.2 Co-existence studies

Co-existence studies have been performed for lower order combinations.

Co-existence analysis for DC\_28\_n1 UL shows that 3rd HAM might fall into DL band n1 This is already covered in Table 7.3B.2.3.1-1 and Table 7.3B.2.3.1-2 in 38.101-3. Further, is shows that 2th IMD may fall in DL band 7.

Co-existence analysis for DC\_7\_n1 UL shows that 5th IMD may fall in DL band 28.

5.22.3 ∆TIB and ∆RIB values

Table 5.22.3-1: ΔTIB,c

| Inter-band DC configuration | E-UTRA or NR Band | ΔTIB,c (dB) |
| --- | --- | --- |
| DC\_7-28\_n1 | 7 | 0.6 |
| 28 | 0.6 |
| n1 | 0.5 |

Table 5.22.3-2: ΔRIB

| Inter-band DC configuration | E-UTRA or NR Band | ΔRIB,c (dB) |
| --- | --- | --- |
| DC\_7-28\_n1 | 7 | 0 |
| 28 | 0.2 |
| n1 | 0 |

5.22.4 Reference sensitivity exceptions

REFSENS exceptions needed due to band 28 uplink harmonic into band n1 is already specified for DC\_28A\_n1A.

Based on co-existence studies additional MSD is needed. The MSD levels are derived from the text proposal in R4-2011610 and R4-2010889.

Table 5.22.4-1: 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\_7A-28A\_n1A | 7 | 2535 | 5 | 25 | 2655 | N/A | N/A |
| 28 | 725 | 5 | 25 | 780 | 4.3 | IMD5 |
| n1 | 1950 | 5 | 25 | 2165 | N/A | N/A |
| 7 | 2545 | 5 | 25 | 2665 | 29.0 | IMD2 |
| 28 | 730 | 5 | 25 | 785 | N/A | N/A |
| n1 | 1935 | 5 | 25 | 2125 | N/A | N/A |

## 5.23 DC\_7-66\_n5

### 5.23.1 Configurations for DC

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

| DC  configuration | Uplink configuration |
| --- | --- |
| DC\_7A-66A\_n5A  DC\_7C-66A\_n5A  DC\_7A-66A-66A\_n5A  DC\_7C-66A-66A\_n5A  DC\_7A-7A-66A\_n5A  DC\_7A-7A-66A-66A\_n5A | DC\_7A\_n5A  DC\_66A\_n5A |

### 5.23.2 Co-existence studies

For UE coexistence study of Band 7 + Band n5, the 2nd, 3rd, 4th and 5th order harmonics and 2nd, 3rd, 4th and 5th order intermodulation products were calculated and presented in Table 5.23.2-1.

**Table 5.23.2-1: Harmonic and IMD analysis**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **UE UL carriers** | **fx\_low** | **fx\_high** | **fy\_low** | **fy\_high** |
| UL frequency (MHz) | 824 | 849 | 2500 | 2570 |
| 2nd harmonics frequency limits | 2\*fx\_low | 2\*fx\_high | 2\* fy\_low | 2\* fy\_high |
| 2nd harmonics frequency limits (MHz) | 1648 | 1698 | 5000 | 5140 |
| 3rd harmonics frequency limits | 3\*fx\_low | 3\*fx\_high | 3\* fy\_low | 3\* fy\_high |
| 3rd harmonics frequency limits (MHz) | 2472 | 2547 | 7500 | 7710 |
| 4th harmonics frequency limits | 4\*fx\_low | 4\*fx\_high | 4\* fy\_low | 4\* fy\_high |
| 4th harmonics frequency limits (MHz) | 3296 | 3396 | 10000 | 10280 |
| 5th harmonics frequency limits | 5\*fx\_low | 5\*fx\_high | 5\* fy\_low | 5\* fy\_high |
| 5th harmonics frequency limits (MHz) | 4120 | 4245 | 12500 | 12850 |
| Two tone 2nd order IMD products | fy\_low – fx\_high | fy\_high – fx\_low | fx\_low + fy\_low | fx\_high + fy\_high |
| IMD frequency limits (MHz) | 1651 | 1746 | 3324 | 3419 |
| 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) | 922 | 802 | 4151 | 4316 |
| 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) | 4148 | 4268 | 5824 | 5989 |
| 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) | 98 | 47 | 6651 | 6886 |
| 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) | 4972 | 5117 | 8324 | 8534 |
| Two-tone 4th order IMD products | 2\*fy\_low – 2\*fx\_high | 2\*fy\_high – 2\*fx\_low | 2\*fx\_low + 2\*fy\_low | 2\*fx\_high + 2\*fy\_high |
| IMD frequency limits (MHz) | 3302 | 3492 | 6648 | 6838 |
| Two-tone 5th order IMD products | |4\*fx\_low – fy\_high| | |4\*fx\_high – fy\_low| | 4\*fy\_low – fx\_high | 4\*fy\_high – fx\_low |
| IMD frequency limits (MHz) | 726 | 896 | 9151 | 9456 |
| Two-tone 5th order IMD products | 4\*fx\_low + fy\_low | 4\*fx\_high + fy\_high | 4\*fy\_low + fx\_low | 4\*fy\_high + fx\_high |
| IMD frequency limits (MHz) | 5796 | 5966 | 10824 | 11129 |
| Two-tone 5th order IMD products | |3\*fx\_low – 2\*fy\_high| | |3\*fx\_high – 2\*fy\_low| | 3\*fy\_low – 2\*fx\_high | 3\*fy\_high – 2\*fx\_low |
| IMD frequency limits (MHz) | 2668 | 2453 | 5802 | 6062 |
| 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) | 9148 | 9408 | 7472 | 7687 |

For UE coexistence study of Band 66 + Band n5, the 2nd, 3rd, 4th and 5th order harmonics and 2nd, 3rd, 4th and 5th order intermodulation products were calculated and presented in Table 5.23.2-2

**Table 5.23.2-2: Harmonic and IMD analysis**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **UE UL carriers** | **fx\_low** | **fx\_high** | **fy\_low** | **fy\_high** |
| UL frequency (MHz) | 824 | 849 | 1710 | 1780 |
| 2nd harmonics frequency limits | 2\*fx\_low | 2\*fx\_high | 2\* fy\_low | 2\* fy\_high |
| 2nd harmonics frequency limits (MHz) | 1648 | 1698 | 3420 | 3560 |
| 3rd harmonics frequency limits | 3\*fx\_low | 3\*fx\_high | 3\* fy\_low | 3\* fy\_high |
| 3rd harmonics frequency limits (MHz) | 2472 | 2547 | 5130 | 5340 |
| 4th harmonics frequency limits | 4\*fx\_low | 4\*fx\_high | 4\* fy\_low | 4\* fy\_high |
| 4th harmonics frequency limits (MHz) | 3296 | 3396 | 6840 | 7120 |
| 5th harmonics frequency limits | 5\*fx\_low | 5\*fx\_high | 5\* fy\_low | 5\* fy\_high |
| 5th harmonics frequency limits (MHz) | 4120 | 4245 | 8550 | 8900 |
| Two tone 2nd order IMD products | fy\_low – fx\_high | fy\_high – fx\_low | fx\_low + fy\_low | fx\_high + fy\_high |
| IMD frequency limits (MHz) | 861 | 956 | 2534 | 2629 |
| 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) | 132 | 12 | 2571 | 2736 |
| 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) | 3358 | 3478 | 4244 | 4409 |
| 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) | 692 | 837 | 4281 | 4516 |
| 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) | 4182 | 4327 | 5954 | 6164 |
| Two-tone 4th order IMD products | 2\*fy\_low – 2\*fx\_high | 2\*fy\_high – 2\*fx\_low | 2\*fx\_low + 2\*fy\_low | 2\*fx\_high + 2\*fy\_high |
| IMD frequency limits (MHz) | 1722 | 1912 | 5068 | 5258 |
| Two-tone 5th order IMD products | |4\*fx\_low – fy\_high| | |4\*fx\_high – fy\_low| | 4\*fy\_low – fx\_high | 4\*fy\_high – fx\_low |
| IMD frequency limits (MHz) | 1516 | 1686 | 5991 | 6296 |
| Two-tone 5th order IMD products | 4\*fx\_low + fy\_low | 4\*fx\_high + fy\_high | 4\*fy\_low + fx\_low | 4\*fy\_high + fx\_high |
| IMD frequency limits (MHz) | 5006 | 5176 | 7664 | 7969 |
| Two-tone 5th order IMD products | |3\*fx\_low – 2\*fy\_high| | |3\*fx\_high – 2\*fy\_low| | 3\*fy\_low – 2\*fx\_high | 3\*fy\_high – 2\*fx\_low |
| IMD frequency limits (MHz) | 1088 | 873 | 3432 | 3692 |
| 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) | 6778 | 7038 | 5892 | 6107 |

Based on co-existence study as presented in the table 5.1.28.4-1 and 5.1.28.4-2, own Rx impact of the 3rd band is shown as the followings.

* 2nd order IMD generated by dual uplink of Band 66 + Band n5 may also fall into own Rx of band 7
* 3rd order IMD generated by dual uplink of Band 66 + Band n5 may also fall into own Rx of band 7

### 5.23.3 ∆TIB and ∆RIB values

Table 5.23.3-1: ΔTIB,c

| Inter-band DC Configuration | E-UTRA and NR Band | ΔTIB,c [dB] |
| --- | --- | --- |
| DC\_7-66\_n5  DC\_7-66-66\_n5  DC\_7-7-66\_n5  DC\_7-7-66-66\_n5 | 7 | 0.3 |
| 66 | 0.3 |
| n5 | 0.3 |

**Table 5.23.3-2: ΔRIB**

| Inter-band DC Configuration | E-UTRA and NR Band | ΔRIB [dB] |
| --- | --- | --- |
| DC\_7-66\_n5  DC\_7-66-66\_n5  DC\_7-7-66\_n5  DC\_7-7-66-66\_n5 | 7 | 0 |
| 66 | 0 |
| n5 | 0 |

### 5.23.4 Reference sensitivity exceptions

Band 66 has similar UL frequency ranges as band 3, the MSD values for DC\_3-7\_n5 can be reused for DC\_7-66\_n5. Table 5.23.4-1 lists the MSD required for DC\_7-66\_n5.

**Table 5.23.4-1: MSD for the DC configuration due to IMD issue (three bands)**

| **NR or E-UTRA Band / Channel bandwidth / NRB / MSD** | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **EN-DC Configuration** | **EUTRA / NR band** | **UL Fc  (MHz)** | **UL/DL BW  (MHz)** | **UL**  **LCRB** | **DL Fc (MHz)** | **MSD  (dB)** | **IMD order** |
| DC\_7A-66A\_n5A  DC\_7C-66A\_n5A  DC\_7A-66A-66A\_n5A  DC\_7C-66A-66A\_n5A  DC\_7A-7A-66A\_n5A  DC\_7A-7A-66A-66A\_n5A | 7 | 2505 | 10 | 50 | 2625 | 30.0 | IMD21 |
| 66 | 1775 | 10 | 50 | 2175 | N/A | N/A |
| n5 | 846.5 | 5 | 25 | 891.5 | N/A | N/A |
| NOTE 1: This band is subject to IMD3 also which MSD is not specified. | | | | | | | |

## 5.24 DC\_2-7\_n5

### 5.24.1 Configurations for DC

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

| DC  configuration | Uplink configuration |
| --- | --- |
| DC\_2A-7A\_n5A  DC\_2A-7C\_n5A  DC\_2A-7A-7A\_n5A | DC\_2A\_n5A  DC\_7A\_n5A |

### 5.24.2 Co-existence studies

For UE coexistence study of Band 7 + Band n5, the 2nd, 3rd, 4th and 5th 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) | 824 | 849 | 2500 | 2570 |
| 2nd harmonics frequency limits | 2\*fx\_low | 2\*fx\_high | 2\* fy\_low | 2\* fy\_high |
| 2nd harmonics frequency limits (MHz) | 1648 | 1698 | 5000 | 5140 |
| 3rd harmonics frequency limits | 3\*fx\_low | 3\*fx\_high | 3\* fy\_low | 3\* fy\_high |
| 3rd harmonics frequency limits (MHz) | 2472 | 2547 | 7500 | 7710 |
| 4th harmonics frequency limits | 4\*fx\_low | 4\*fx\_high | 4\* fy\_low | 4\* fy\_high |
| 4th harmonics frequency limits (MHz) | 3296 | 3396 | 10000 | 10280 |
| 5th harmonics frequency limits | 5\*fx\_low | 5\*fx\_high | 5\* fy\_low | 5\* fy\_high |
| 5th harmonics frequency limits (MHz) | 4120 | 4245 | 12500 | 12850 |
| Two tone 2nd order IMD products | fy\_low – fx\_high | fy\_high – fx\_low | fx\_low + fy\_low | fx\_high + fy\_high |
| IMD frequency limits (MHz) | 1651 | 1746 | 3324 | 3419 |
| 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) | 922 | 802 | 4151 | 4316 |
| 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) | 4148 | 4268 | 5824 | 5989 |
| 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) | 98 | 47 | 6651 | 6886 |
| 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) | 4972 | 5117 | 8324 | 8534 |
| Two-tone 4th order IMD products | 2\*fy\_low – 2\*fx\_high | 2\*fy\_high – 2\*fx\_low | 2\*fx\_low + 2\*fy\_low | 2\*fx\_high + 2\*fy\_high |
| IMD frequency limits (MHz) | 3302 | 3492 | 6648 | 6838 |
| Two-tone 5th order IMD products | |4\*fx\_low – fy\_high| | |4\*fx\_high – fy\_low| | 4\*fy\_low – fx\_high | 4\*fy\_high – fx\_low |
| IMD frequency limits (MHz) | 726 | 896 | 9151 | 9456 |
| Two-tone 5th order IMD products | 4\*fx\_low + fy\_low | 4\*fx\_high + fy\_high | 4\*fy\_low + fx\_low | 4\*fy\_high + fx\_high |
| IMD frequency limits (MHz) | 5796 | 5966 | 10824 | 11129 |
| Two-tone 5th order IMD products | |3\*fx\_low – 2\*fy\_high| | |3\*fx\_high – 2\*fy\_low| | 3\*fy\_low – 2\*fx\_high | 3\*fy\_high – 2\*fx\_low |
| IMD frequency limits (MHz) | 2668 | 2453 | 5802 | 6062 |
| 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) | 9148 | 9408 | 7472 | 7687 |

For UE coexistence study of Band 2 + Band n5, the 2nd, 3rd, 4th and 5th order harmonics and 2nd, 3rd, 4th and 5th order intermodulation products were calculated and presented in Table 5.24.2-2

**Table 5.24.2-2: Harmonic and IMD analysis**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **UE UL carriers** | **fx\_low** | **fx\_high** | **fy\_low** | **fy\_high** |
| UL frequency (MHz) | 824 | 849 | 1850 | 1910 |
| 2nd harmonics frequency limits | 2\*fx\_low | 2\*fx\_high | 2\* fy\_low | 2\* fy\_high |
| 2nd harmonics frequency limits (MHz) | 1648 | 1698 | 3700 | 3820 |
| 3rd harmonics frequency limits | 3\*fx\_low | 3\*fx\_high | 3\* fy\_low | 3\* fy\_high |
| 3rd harmonics frequency limits (MHz) | 2472 | 2547 | 5550 | 5730 |
| 4th harmonics frequency limits | 4\*fx\_low | 4\*fx\_high | 4\* fy\_low | 4\* fy\_high |
| 4th harmonics frequency limits (MHz) | 3296 | 3396 | 7400 | 7640 |
| 5th harmonics frequency limits | 5\*fx\_low | 5\*fx\_high | 5\* fy\_low | 5\* fy\_high |
| 5th harmonics frequency limits (MHz) | 4120 | 4245 | 9250 | 9550 |
| Two tone 2nd order IMD products | fy\_low – fx\_high | fy\_high – fx\_low | fx\_low + fy\_low | fx\_high + fy\_high |
| IMD frequency limits (MHz) | 1001 | 1086 | 2674 | 2759 |
| 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) | 262 | 152 | 2851 | 2996 |
| 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) | 3498 | 3608 | 4524 | 4669 |
| 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) | 562 | 697 | 4701 | 4906 |
| 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) | 4322 | 4457 | 6374 | 6554 |
| Two-tone 4th order IMD products | 2\*fy\_low – 2\*fx\_high | 2\*fy\_high – 2\*fx\_low | 2\*fx\_low + 2\*fy\_low | 2\*fx\_high + 2\*fy\_high |
| IMD frequency limits (MHz) | 2002 | 2172 | 5348 | 5518 |
| Two-tone 5th order IMD products | |4\*fx\_low – fy\_high| | |4\*fx\_high – fy\_low| | 4\*fy\_low – fx\_high | 4\*fy\_high – fx\_low |
| IMD frequency limits (MHz) | 1386 | 1546 | 6551 | 6816 |
| Two-tone 5th order IMD products | 4\*fx\_low + fy\_low | 4\*fx\_high + fy\_high | 4\*fy\_low + fx\_low | 4\*fy\_high + fx\_high |
| IMD frequency limits (MHz) | 5146 | 5306 | 8224 | 8489 |
| Two-tone 5th order IMD products | |3\*fx\_low – 2\*fy\_high| | |3\*fx\_high – 2\*fy\_low| | 3\*fy\_low – 2\*fx\_high | 3\*fy\_high – 2\*fx\_low |
| IMD frequency limits (MHz) | 1348 | 1153 | 3852 | 4082 |
| 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) | 7198 | 7428 | 6172 | 6367 |

Based on co-existence study as presented in the table 5.24.2-1 and 5.24.2-2, own Rx impact of the 3rd band is shown as the followings.

* 2nd order IMD generated by dual uplink of Band 2 + Band n5 may also fall into own Rx of band 7

### 5.24.3 ∆TIB and ∆RIB values

Table 5.24.3-1: ΔTIB,c

| Inter-band DC Configuration | E-UTRA and NR Band | ΔTIB,c [dB] |
| --- | --- | --- |
| DC\_2-7\_n5  DC\_2-7-7\_n5 | 2 | 0.3 |
| 7 | 0.3 |
| n5 | 0.3 |

**Table 5.24.3-2: ΔRIB**

| Inter-band DC Configuration | E-UTRA and NR Band | ΔRIB [dB] |
| --- | --- | --- |
| DC\_2-7\_n5  DC\_2-7-7\_n5 | 2 | 0 |
| 7 | 0 |
| n5 | 0 |

### 5.24.4 Reference sensitivity exceptions

By adjusting the centre frequency of uplink of Band 2+ Band n5, the MSD requirement due to 2nd order IMD for DC\_2-7\_n5 can be similar as the requirements of DC\_3-7\_n5. Table 5.1.28.4-3 lists the MSD required for DC\_2-7\_n5.

**Table 5.24.4-1: MSD for the DC configuration due to IMD issue (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\_n5A  DC\_2A-7C\_n5A  DC\_2A-7A-7A\_n5A | 2 | 1855 | 10 | 50 | 1935 | N/A | N/A |
| 7 | 2575 | 10 | 50 | 2685 | 30.0 | IMD2 |
| n5 | 830 | 5 | 25 | 875 | N/A | N/A |

## 5.25 DC\_1-40\_n78

5.25.1 Operating bands for DC

Table 5.25.1-1: Band combinations EN-DC (three bands)

| EN-DC Band | E-UTRA Band | NR Band | Single UL allowed |
| --- | --- | --- | --- |
| DC\_1-40\_n78 | CA\_1-40 | n78 | No |

5.25.2 Configurations for DC

Table 5.25.2-1: Inter-band EN-DC configurations (three bands)

| EN-DC  configuration | Uplink EN-DC  configuration  (NOTE 1) | E-UTRA configuration | NR configuration |
| --- | --- | --- | --- |
| DC\_1A-40A\_n78A  DC\_1A-40C\_n78A | DC\_1A\_n78A  DC\_40A\_n78A | CA\_1A-40A  CA\_1A-40C | n78 |

5.25.3 Co-existence studies

Based on co-existence studies of Band 1 + Band n78 captured in 37.863-01-01, MSD shall be considered since

- 4th order IMD of the two bands may fall into Rx frequencies of band 1 and band 40.

And based on co-existence studies of Band 40 + Band n78 captured in 37.716-11-11, MSD shall be considered since

- 4th order IMD generated by dual uplink of the two bands may fall into own Rx of band 1.

- harmonic mixing generated by 2nd harmonic of n78 Tx and 3rd harmonic of band 40 Rx.

5.25.4 ∆TIB and ∆RIB values

Table 5.25.4-1: ΔTIB,c

| Inter-band DC Configuration | E-UTRA and NR Band | ΔTIB,c [dB] |
| --- | --- | --- |
| DC\_1-40-n78 | 1 | 0.6 |
| 40 | 0.35 |
| n78 | 0.85 |
| NOTE 5: Only applicable for UE supporting inter-band carrier aggregation with uplink in one NR band and without simultaneous Rx/Tx. | | |

**Table 5.25.4-2: ΔRIB**

| Inter-band DC Configuration | E-UTRA and NR Band | ΔRIB [dB] |
| --- | --- | --- |
| DC\_1-40-n78 | 1 | 0.2 |
| 40 | 0.45 |
| n78 | 0.55 |
| NOTE 5: Only applicable for UE supporting inter-band carrier aggregation with uplink in one NR band and without simultaneous Rx/Tx. | | |

5.25.5 REFSENS requirements

As stated in 5.25.3, for MSD requirement caused by IMDs is specified below accordingly. To note that the MSD requirements are already defined for DC\_1A\_n40A-n78A in TS 38.101-3, among which the one for IMD4 on band n40 can be followed here for band 40 IMD4 impact. The requirements apply both to DC\_1A-40A\_n78A and DC\_1A-40C\_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-40A\_n78A  DC\_1A-40C\_n78A | 1 | 1930 | 5 | 25 | 2120 | N/A | N/A |
| 40 | 2340 | 5 | 25 | 2340 | 10.6 | IMD4 |
| n78 | 3450 | 10 | 50 | 3450 | N/A | N/A |
| DC\_1A-40A\_n78A  DC\_1A-40C\_n78A | 1 | 1950 | 5 | 25 | 2140 | 9.1 | IMD4 |
| 40 | 2360 | 5 | 25 | 2360 | N/A | N/A |
| n78 | 3430 | 10 | 50 | 3430 | N/A | N/A |

Other issues mentioned in 5.25.3 (i.e., harmonic mixing between band 40 Rx and n78 Tx, and MSD for band 1 caused by 4th IMD of band 1 and n78) had already been specified in the corresponding specs.

## 5.26 DC\_3-40\_n78

5.26.1 Operating bands for DC

Table 5.26.1-1: Band combinations EN-DC (three bands)

| EN-DC Band | E-UTRA Band | NR Band | Single UL allowed |
| --- | --- | --- | --- |
| DC\_3-40\_n78 | CA\_3-40 | n78 | DC\_3\_n78 |

5.26.2 Configurations 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 configuration | NR configuration |
| --- | --- | --- | --- |
| DC\_3A-40A\_n78A  DC\_3A-40C\_n78A | DC\_3A\_n78A  DC\_40A\_n78A | CA\_3A-40A  CA\_3A-40C | n78 |

5.26.3 Co-existence studies

Based on co-existence studies of Band 3 + Band n78 captured in 37.863-01-01, MSD shall be considered since

- 2nd 4th and 5th order IMD of the two bands may fall into Rx frequencies of band 3

- 2nd harmonic of band 3 may fall into Rx frequencies of n78

- 5th order IMD of the two bands may fall into Rx frequencies of band 40

And based on co-existence studies of Band 40 + Band n78 captured in 37.716-11-11, MSD shall be considered since

- 4th order IMD generated by dual uplink of the two bands may fall into own Rx of band 3.

5.26.4 ∆TIB and ∆RIB values

Table 5.26.4-1: ΔTIB,c

| Inter-band DC Configuration | E-UTRA and NR Band | ΔTIB,c [dB] |
| --- | --- | --- |
| DC\_3-40-n78 | 3 | 0.6 |
| 40 | 0.35 |
| n78 | 0.85 |
| NOTE 5: Only applicable for UE supporting inter-band carrier aggregation with uplink in one NR band and without simultaneous Rx/Tx. | | |

**Table 5.26.4-2: ΔRIB**

| Inter-band DC Configuration | E-UTRA and NR Band | ΔRIB [dB] |
| --- | --- | --- |
| DC\_3-40-n78 | 3 | 0.2 |
| 40 | 0.45 |
| n78 | 0.55 |
| NOTE 5: Only applicable for UE supporting inter-band carrier aggregation with uplink in one NR band and without simultaneous Rx/Tx. | | |

5.26.5 REFSENS requirements

As stated in 5.26.3, for MSD requirement caused by IMDs is specified below accordingly. To note that the MSD requirements are already defined for DC\_3A\_n40A-n78A in TS 38.101-3, among which the one for IMD4 on band n40 can be followed here for band 40 IMD4 impact. The below requirements apply both to DC\_3A-40A\_n78A and DC\_3A-40C\_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-40A\_n78A  DC\_3A-40C\_n78A | 3 | 1775 | 5 | 25 | 1870 | 9.1 | IMD4 |
| 40 | 2390 | 5 | 25 | 2390 | N/A | N/A |
| n78 | 3325 | 10 | 50 | 3325 | N/A | N/A |
| DC\_3A-40A\_n78A  DC\_3A-40C\_n78A | 3 | 1720 | 5 | 25 | 1815 | N/A | N/A |
| 40 | 2360 | 5 | 25 | 2360 | 4.4 | IMD5 |
| n78 | 3760 | 10 | 50 | 3760 | N/A | N/A |

Other issues mentioned in 5.26.3 (i.e., 2nd harmonic from band 3 and MSD for band 3 caused by 2nd, 4th and 5th IMD of band 3 and n78) had already been specified in the corresponding specs. To note that due to the high IMD impact, single UL is allowed between band 3 and band n78.

## 5.27 DC\_7-40\_n78

5.27.1 Operating bands for DC

Table 5.27.1-1: Band combinations EN-DC (three bands)

| EN-DC Band | E-UTRA Band | NR Band | Single UL allowed |
| --- | --- | --- | --- |
| DC\_7-40\_n78 | CA\_7-40 | n78 | No |

5.27.2 Configurations 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 configuration | NR configuration |
| --- | --- | --- | --- |
| DC\_7A-40A\_n78A  DC\_7A-40C\_n78A | DC\_7A\_n78A  DC\_40A\_n78A | CA\_7A-40A  CA\_7A-40C | n78 |

5.27.3 Co-existence studies

Based on co-existence studies of Band 7 + Band n78 captured in 37.863-01-01, MSD shall be considered since

- 4th order IMD of the two bands may fall into Rx frequencies of band 40

And based on co-existence studies of Band 40 + Band n78 captured in 37.716-11-11, MSD shall be considered since

- 4th order IMD generated by dual uplink of the two bands may fall into Rx of band 7.

- harmonic mixing generated by 2nd harmonic of n78 Tx and 3rd harmonic of band 40 Rx.

5.27.4 ∆TIB and ∆RIB values

Table 5.27.4-1: ΔTIB,c

| Inter-band DC Configuration | E-UTRA and NR Band | ΔTIB,c [dB] |
| --- | --- | --- |
| DC\_7-40-n78 | 7 | 0.5 |
| 40 | 0.35 |
| n78 | 0.85 |
| NOTE 5: Only applicable for UE supporting inter-band carrier aggregation with uplink in one NR band and without simultaneous Rx/Tx. | | |

**Table 5.27.4-2: ΔRIB**

| Inter-band DC Configuration | E-UTRA and NR Band | ΔRIB [dB] |
| --- | --- | --- |
| DC\_7-40-n78 | 7 | 0 |
| 40 | 0.45 |
| n78 | 0.55 |
| NOTE 5: Only applicable for UE supporting inter-band carrier aggregation with uplink in one NR band and without simultaneous Rx/Tx. | | |

5.27.5 REFSENS requirements

As stated in 5.27.3, for MSD requirement caused by IMDs is specified below accordingly. The requirements apply both to DC\_7A-40A\_n78A and DC\_7A-40C\_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-40A\_n78A  DC\_7A-40C\_n78A | 7 | 2510 | 5 | 25 | 2630 | 10.1 | IMD4 |
| 40 | 2310 | 5 | 25 | 2310 | N/A | N/A |
| n78 | 3625 | 10 | 50 | 3625 | N/A | N/A |
| DC\_7A-40A\_n78A  DC\_7A-40C\_n78A | 7 | 2510 | 5 | 25 | 2630 | N/A | N/A |
| 40 | 2310 | 5 | 25 | 2310 | 8.7 | IMD4 |
| n78 | 3785 | 10 | 50 | 3785 | N/A | N/A |

Other issues mentioned in 5.27.3 had already been specified in the corresponding specs.

## 5.28 DC\_8-40\_n78

5.28.1 Operating bands for DC

Table 5.28.1-1: Band combinations EN-DC (three bands)

| EN-DC Band | E-UTRA Band | NR Band | Single UL allowed |
| --- | --- | --- | --- |
| DC\_8-40\_n78 | CA\_8-40 | n78 | No |

5.28.2 Configurations for DC

Table 5.28.2-1: Inter-band EN-DC configurations (three bands)

| EN-DC  configuration | Uplink EN-DC  configuration  (NOTE 1) | E-UTRA configuration | NR configuration |
| --- | --- | --- | --- |
| DC\_8A-40A\_n78A  DC\_8A-40C\_n78A | DC\_8A\_n78A  DC\_40A\_n78A | CA\_8A-40A  CA\_8A-40C | n78 |

5.28.3 Co-existence studies

Based on co-existence studies of Band 8 + Band n78 captured in 37.863-01-01, MSD shall be considered since

- 4th order IMD of the two bands may fall into Rx frequencies of band 8

- 4th harmonic of the band 8 may fall into Rx frequencies of band n78

- 2nd order IMD of the two bands may fall into Rx frequencies of band 40, under the cases that band 40 is not in sync with band n78 in TDD configuration

And based on co-existence studies of Band 40 + Band n78 captured in 37.716-11-11, MSD shall be considered since

- 2nd and 3rd order IMD generated by dual uplink of the two bands may fall into own Rx of band 8.

- harmonic mixing generated by 2nd harmonic of n78 Tx and 3rd harmonic of band 40 Rx.

5.28.4 ∆TIB and ∆RIB values

Table 5.28.4-1: ΔTIB,c

| Inter-band DC Configuration | E-UTRA and NR Band | ΔTIB,c [dB] |
| --- | --- | --- |
| DC\_8-40-n78 | 8 | 0.6 |
| 40 | 0.35 |
| n78 | 0.85 |
| NOTE 5: Only applicable for UE supporting inter-band carrier aggregation with uplink in one NR band and without simultaneous Rx/Tx. | | |

**Table 5.28.4-2: ΔRIB**

| Inter-band DC Configuration | E-UTRA and NR Band | ΔRIB [dB] |
| --- | --- | --- |
| DC\_8-40-n78 | 8 | 0.2 |
| 40 | 0.45 |
| n78 | 0.55 |
| NOTE 5: Only applicable for UE supporting inter-band carrier aggregation with uplink in one NR band and without simultaneous Rx/Tx. | | |

5.28.5 REFSENS requirements

As stated in 5.28.3, for MSD requirement caused by IMDs is specified below accordingly. The below requirements apply both to DC\_8A-40A\_n78A and DC\_8A-40C\_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\_8A-40A\_n78A  DC\_8A-40C\_n78A | 8 | 905 | 5 | 25 | 950 | 30.5 | IMD2 |
| 40 | 2380 | 5 | 25 | 2380 | N/A | N/A |
| n78 | 3330 | 10 | 50 | 3330 | N/A | N/A |
| DC\_8A-40A\_n78ADC\_8A-40C\_n78A | 8 | 890 | 5 | 25 | 935 | 19.8 | IMD3 |
| 40 | 2320 | 5 | 25 | 2320 | N/A | N/A |
| n78 | 3705 | 10 | 50 | 3705 | N/A | N/A |
| DC\_8A-40A\_n78A  DC\_8A-40C\_n78A | 8 | 910 | 5 | 25 | 955 | N/A | N/A |
| 40 | 2395 | 5 | 25 | 2395 | 28 | IMD2 |
| n78 | 3305 | 10 | 50 | 3305 | N/A | N/A |

Other issues mentioned in 5.28.3 had already been specified in the corresponding specs.

## 5.29 DC\_2-4\_n28

5.29.1 Configurations for DC

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

| DC  configuration | Uplink  configuration |
| --- | --- |
| DC\_2A-4A\_n28A | DC\_2A\_n28A  DC\_4A\_n28A |

5.29.2 Co-existence studies

Co-existence studies on DC\_4\_n28 and DC\_2\_n28 show own Rx impact of the 3rd band due to dual UL as following:

- IMD4 by dual UL of Band 4 and Band n28 may fall into Band 2 DL.

5.29.3 ∆TIB and ∆RIB values

For DC\_2-4\_n28, the ΔTIB,c and ΔRIB,c values are reused from the LTE combination CA\_2-4-28, and are given in the tables below.

Table 5.29.3-1: ΔTIB,c

| Inter-band DC Configuration | E-UTRA and NR Band | ΔTIB,c [dB] |
| --- | --- | --- |
| DC\_2-4-n28 | 2 | 0.5 |
| 4 | 0.5 |
| n28 | 0.8 |

**Table 5.29.3-2: ΔRIB**

| Inter-band DC Configuration | E-UTRA and NR Band | ΔRIB [dB] |
| --- | --- | --- |
| DC\_2-4-n28 | 2 | 0.3 |
| 4 | 0.3 |
| n28 | 0.5 |

5.29.4 REFSENS requirements

The MSD value for the impact on Band 2 DL by dual uplink of Band 4 + Band n28 stated in 5.29.2 is shown in the following table.

Table 5.29.4-1: 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\_2A-4A\_n28A | 2 | 1880 | 5 | 25 | 1960 | 11.0 | FDD | IMD4 |
| 4 | 1720 | 5 | 25 | 2120 | N/A | FDD | N/A |
| n28 | 740 | 5 | 25 | 795 | N/A | FDD | N/A |

## 5.30 DC\_2-7\_n28

5.30.1 Configurations for DC

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

| DC  configuration | Uplink  configuration |
| --- | --- |
| DC\_2A-7A\_n28A | DC\_2A\_n28A  DC\_7A\_n28A |

5.30.2 Co-existence studies

Co-existence analysis from DC\_2\_n28 shows that there is IMD2 impact from DC\_2\_n28 UL to Band 7 DL. And there is no IMD impact from DC\_7\_n28 UL to Band 2 DL.

5.30.3 ∆TIB and ∆RIB values

For DC\_2-7\_n28, the ΔTIB,c and ΔRIB,c values are reused from the LTE combination CA\_2-7-28, and are given in the tables below.

Table 5.30.3-1: ΔTIB,c

| Inter-band DC Configuration | E-UTRA and NR Band | ΔTIB,c [dB] |
| --- | --- | --- |
| DC\_2-7-n28 | 2 | 0.5 |
| 7 | 0.5 |
| n28 | 0.3 |

**Table 5.30.3-2: ΔRIB**

| Inter-band DC Configuration | E-UTRA and NR Band | ΔRIB [dB] |
| --- | --- | --- |
| DC\_2-7-n28 | 2 | 0 |
| 7 | 0 |
| n28 | 0 |

5.30.4 REFSENS requirements

The MSD value for the impact on Band 7 DL by dual uplink of Band 2 + Band n28 stated in 5.30.2 is shown in the following table.

Table 5.30.4-1: 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\_2A-7A\_n28A | 2 | 1880 | 5 | 25 | 1960 | N/A | FDD | N/A |
| 7 | 1720 | 5 | 25 | 2120 | 29.0 | FDD | IMD2 |
| n28 | 740 | 5 | 25 | 795 | N/A | FDD | N/A |

## 5.31 DC\_2-66\_n28

5.31.1 Configurations for DC

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

| DC  configuration | Uplink  configuration |
| --- | --- |
| DC\_2A-66A\_n28A | DC\_2A\_n28A  DC\_66A\_n28A |

5.31.2 Co-existence studies

Co-existence studies on DC\_28\_n66 and DC\_2\_n28 show the following own Rx impact of the 3rd band:

- IMD4 by dual UL of Band 66 and Band n28 may fall into Band 2 DL.

5.31.3 ∆TIB and ∆RIB values

For DC\_2-66\_n28, the ΔTIB,c and ΔRIB,c values are reused from the LTE combination CA\_2-66-28, and are given in the tables below.

Table 5.31.3-1: ΔTIB,c

| Inter-band DC Configuration | E-UTRA and NR Band | ΔTIB,c [dB] |
| --- | --- | --- |
| DC\_2-66-n28 | 2 | 0.5 |
| 66 | 0.5 |
| n28 | 0.6 |

**Table 5.31.3-2: ΔRIB**

| Inter-band DC Configuration | E-UTRA and NR Band | ΔRIB [dB] |
| --- | --- | --- |
| DC\_2-66-n28 | 2 | 0.3 |
| 66 | 0.3 |
| n28 | 0.2 |

5.31.4 REFSENS requirements

The MSD value for the impact on Band 2 DL by dual uplink of Band 66 + Band n28 stated in 5.31.2 is shown in the following table.

Table 5.31.4-1: 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\_2A-66A\_n28A | 2 | 1880 | 5 | 25 | 1960 | 11.0 | FDD | IMD4 |
| 66 | 1720 | 5 | 25 | 2120 | N/A | FDD | N/A |
| n28 | 740 | 5 | 25 | 795 | N/A | FDD | N/A |

## 5.32 DC\_4-7\_n28

5.32.1 Configurations for DC

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

| DC  configuration | Uplink configuration |
| --- | --- |
| DC\_4A-7A\_n28A | DC\_4A\_n28A  DC\_7A\_n28A |

5.32.2 Co-existence studies

Based on the co-existence studies of DC\_4\_n28 and DC\_7\_n28, own Rx impact of the 3rd band are the following:

- IMD3 by dual UL of Band 4 and Band n28 may fall into Band 7 DL.

5.32.3 ∆TIB and ∆RIB values

For DC\_4-7\_n28, the ΔTIB,c and ΔRIB,c values are reused from the LTE combination CA\_4-7-28, and are given in the tables below.

Table 5.32.3-1: ΔTIB,c

| Inter-band DC Configuration | E-UTRA and NR Band | ΔTIB,c [dB] |
| --- | --- | --- |
| DC\_4-7-n28 | 4 | 0.5 |
| 7 | 0.5 |
| n28 | 0.6 |

**Table 5.32.3-2: ΔRIB**

| Inter-band DC Configuration | E-UTRA and NR Band | ΔRIB [dB] |
| --- | --- | --- |
| DC\_4-7-n28 | 4 | 0.5 |
| 7 | 0.5 |
| n28 | 0.2 |

5.32.4 REFSENS requirements

The MSD values for own Rx impact of the 3rd band stated in 5.32.2 are shown in the following table.

Table 5.32.4-1: 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\_4A-7A\_n28A | 4 | 1715 | 5 | 25 | 2115 | N/A | FDD | N/A |
| 7 | 2565 | 5 | 25 | 2685 | 18.0 | FDD | IMD3 |
| n28 | 745 | 5 | 25 | 800 | N/A | FDD | N/A |

## 5.33 DC\_5-7\_n66

5.33.1 Configurations for DC

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

| DC  configuration | Uplink  configuration |
| --- | --- |
| DC\_5A-7A\_n66A  DC\_5A-7C\_n66A | DC\_5A\_n66A  DC\_7A\_n66A |

5.33.2 Co-existence studies

Co-existence studies on DC\_7\_n66 and DC\_5\_n66 show own Rx impact on the 3rd band due to dual uplink as follows:

- IMD3 of dual uplink of Band 7 and n66 may fall into Band 5 DL,

- IMD2 and IMD3 of dual uplink of Band 5 and n66 may fall into Band 7 DL.

5.33.3 ∆TIB and ∆RIB values

For DC\_5-7\_n66, the ΔTIB,c and ΔRIB,c values are reused from the LTE combination CA\_5-7-66, and are given in the tables below.

Table 5.33.3-1: ΔTIB,c

| Inter-band DC Configuration | E-UTRA and NR Band | ΔTIB,c [dB] |
| --- | --- | --- |
| DC\_5-7-n66 | 5 | 0.3 |
| 7 | 0.5 |
| n66 | 0.5 |

**Table 5.33.3-2: ΔRIB**

| Inter-band DC Configuration | E-UTRA and NR Band | ΔRIB [dB] |
| --- | --- | --- |
| DC\_5-7-n66 | 5 | 0 |
| 7 | 0.5 |
| n66 | 0.5 |

5.33.4 REFSENS requirements

The MSD values for own Rx impact of the 3rd band stated in 5.33.2 are shown in the following table. The MSD levels are derived from the text proposal in R4-2009928 and R4-2014128.

Table 5.33.4-1: 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\_5A-7A\_n66A  DC\_5A-7C\_n66A | 5 | 835 | 5 | 25 | 880 | 17.8 | FDD | IMD3 |
| 7 | 2560 | 5 | 25 | 2680 | N/A | FDD | N/A |
| 66 | 1720 | 5 | 25 | 2120 | N/A | FDD | N/A |
| 5 | 846.5 | 5 | 25 | 891.5 | N/A | FDD | N/A |
| 7 | 2504 | 5 | 25 | 2624 | 29.0 | FDD | IMD21 |
| 66 | 1777.5 | 5 | 25 | 2177.5 | N/A | FDD | N/A |
| NOTE 1: This band is subject to IMD3 also which MSD is not specified. | | | | | | | | |

## 5.34 DC\_7-66\_n28

5.34.1 Configurations for DC

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

| DC  configuration | Uplink  configuration |
| --- | --- |
| DC\_7A-66A\_n28A | DC\_7A\_n28A  DC\_66A\_n28A |

5.34.2 Co-existence studies

Based on the co-existence studies of DC\_66\_n28 and DC\_7\_n28, own Rx impact of the 3rd band are the following:

- IMD3 by dual UL of Band 66 and Band n28 may fall into Band 7 DL.

5.34.3 ∆TIB and ∆RIB values

For DC\_7-66\_n28, the ΔTIB,c and ΔRIB,c values are reused from the LTE combination CA\_4-7-28, and are given in the tables below.

Table 5.34.3-1: ΔTIB,c

| Inter-band DC Configuration | E-UTRA and NR Band | ΔTIB,c [dB] |
| --- | --- | --- |
| DC\_7-66-n28 | 2 | 0.5 |
| 66 | 0.5 |
| n28 | 0.6 |

**Table 5.34.3-2: ΔRIB**

| Inter-band DC Configuration | E-UTRA and NR Band | ΔRIB [dB] |
| --- | --- | --- |
| DC\_7-66-n28 | 7 | 0.5 |
| 66 | 0.5 |
| n28 | 0.2 |

5.34.4 REFSENS requirements

The MSD values for own Rx impact of the 3rd band stated in 5.34.2 are shown in the following table.

Table 5.34.4-1: 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\_7A-66A\_n28A | 7 | 2565 | 5 | 25 | 2685 | 18.0 | FDD | IMD3 |
| 66 | 1715 | 5 | 25 | 2115 | N/A | FDD | N/A |
| n28 | 745 | 5 | 25 | 800 | N/A | FDD | N/A |

## 5.35 DC\_1-11\_n28

5.35.1 Configurations for DC\_1-11\_n28

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

| EN-DC  configuration | Uplink EN-DC  configuration  (NOTE 1) | E-UTRA configuration | NR configuration |
| --- | --- | --- | --- |
| DC\_1A-11A\_n28A | DC\_1A\_n28A  DC\_11A\_n28A | CA\_1A-11A | n28A |

5.35.2 Co-existence studies

When Uplink EN-DC configuration is DC\_11A\_n28A, IMD2 and IMD3 of (B11 - n28) will fall into Rx band of Band 1. But considering the current situation that Band 11 is operated only by a certain operators in Japan, the frequency ranges can be limited as follows.

* Operator X: B11 (UL:1427.9-1437.9 / DL:1475.9-1485.9 MHz), B1 (UL:1960-1980 / DL:2150-2170 MHz), n28 (UL:738-748 / DL:793-803 MHz)
* Opeartor Y: B11 (UL:1437.9-1447.9 / DL:1485.9-1495.9 MHz), B1 (UL:1920-1940 / DL:2110-2130 MHz), n28 (UL:718-728 / DL:773-783 MHz)

Based on the existing frequency restriction in Japan, RAN4 only need to analyze the IMD2 problem as follow

* IMD2 by dual uplink DC\_11\_n28 will fall into the own Rx band of Band 1
* IMD3 by dual uplink DC\_11\_n28 is not specified due to the current operator spectrum holding.

5.35.3 ∆TIB and ∆RIB values

The following relaxation values are proposed:

Table 5.35.3-1: ΔTIB,c

| Inter-band EN-DC configuration | E-UTRA or NR Band | ΔTIB,c (dB) |
| --- | --- | --- |
| DC\_1-11\_n28 | 1 | 0.3 |
| 11 | 0.4 |
| n28 | 0.6 |

Table 5.35.3-2: ΔRIB

|  |  |  |
| --- | --- | --- |
| Inter-band EN-DC configuration | NR Band | ΔRIB,c (dB) |
| DC\_1-11\_n28 | 1 | 0 |
| 11 | 0 |
| n28 | 0.2 |

5.35.4 Reference sensitivity exceptions

As mentioned above, IMD2 of B11 and n28 to Band 1 Rx need to be addressed for REFSENS relaxation. The following values are proposed:

Table 5.35.4-1: Reference sensitivity exceptions 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\_1A-11A\_n28A | 11 | 1440 | 5 | 25 | 1488 | N/A | N/A |
| n28 | 710 | 5 | 25 | 765 | N/A | N/A |
| 1 | 1960 | 5 | 25 | 2150 | 28.3 | IMD2 |
| DC\_1A-11A\_n28A | 11 | 1440 | 5 | 5 | 1488 | N/A | N/A |
| n28 | 710 | 5 | 5 | 765 | N/A | N/A |
| 1 | 1975 | 5 | 5 | 2165 | N/A1 | IMD3 |

## 5.36 DC\_3-11\_n28

5.36.1 Configurations for DC\_3-11\_n28

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

| EN-DC  configuration | Uplink EN-DC  configuration  (NOTE 1) | E-UTRA configuration | NR configuration |
| --- | --- | --- | --- |
| DC\_3A-11A\_n28A | DC\_3A\_n28A  DC\_11A\_n28A | CA\_3A-11A | n28A |

5.36.2 Co-existence studies

There is no additional harmonic and intermodulation impact for the additional band receiver.

5.36.3 ∆TIB and ∆RIB values

The following relaxation values are proposed:

Table 5.36.3-1: ΔTIB,c

| Inter-band EN-DC configuration | E-UTRA or NR Band | ΔTIB,c (dB) |
| --- | --- | --- |
| DC\_3-11\_n28 | 3 | 0.8 |
| 11 | 0.9 |
| n28 | 0.6 |

Table 5.36.3-2: ΔRIB

|  |  |  |
| --- | --- | --- |
| Inter-band EN-DC configuration | NR Band | ΔRIB,c (dB) |
| DC\_3-11\_n28 | 3 | 0.3 |
| 11 | 0.5 |
| n28 | 0.2 |

5.36.4 Reference sensitivity exceptions

As mentioned in 5.36.2, REFSENS exceptions are not expected.

## 5.37 DC\_8-11\_n28

5.37.1 Configurations for DC\_8-11\_n28

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

| EN-DC  configuration | Uplink EN-DC  configuration  (NOTE 1) | E-UTRA configuration | NR configuration |
| --- | --- | --- | --- |
| DC\_8A-11A\_n28A | DC\_8A\_n28A  DC\_11A\_n28A | CA\_8A-11A | n28A |

5.37.2 Co-existence studies

There is no additional harmonic and intermodulation impact for the additional band receiver.

5.37.3 ∆TIB and ∆RIB values

The following relaxation values are proposed:

Table 5.37.3-1: ΔTIB,c

| Inter-band EN-DC configuration | E-UTRA or NR Band | ΔTIB,c (dB) |
| --- | --- | --- |
| DC\_8-11\_n28 | 8 | 0.6 |
| 11 | 0.4 |
| n28 | 0.6 |

Table 5.37.3-2: ΔRIB

|  |  |  |
| --- | --- | --- |
| Inter-band EN-DC configuration | NR Band | ΔRIB,c (dB) |
| DC\_8-11\_n28 | 8 | 0.2 |
| 11 | 0 |
| n28 | 0.2 |

5.37.4 Reference sensitivity exceptions

As mentioned in 5.37.2, REFSENS exceptions are not expected.

## 5.38 DC\_3-11\_n77

5.38.1 Configurations for DC\_3-11\_n77

Table 5.38.1-1: Inter-band EN-DC configurations (three bands)

| EN-DC  configuration | Uplink EN-DC  configuration  (NOTE 1) | E-UTRA configuration | NR configuration |
| --- | --- | --- | --- |
| DC\_3A-11A\_n77A | DC\_3A\_n77A  DC\_11A\_n77A | CA\_3A-11A | n77A |
| DC\_3A-11A\_n77(2A) | DC\_3A\_n77A  DC\_11A\_n77A | CA\_3A-11A | n77(2A) |

5.38.2 Co-existence studies

When Uplink EN-DC configuration is DC\_3A\_n77A, (1) IMD4 of (B3 - n77) will fall into Rx band of Band 11. When Uplink EN-DC configuration is DC\_11A\_n77A, (2) IMD2 and (3) IMD5 of (B11 - n77) will fall into Rx band of Band 3.

But considering the current situation that Band 11 is operated only by a certain operators in Japan, the frequency ranges can be limited as follows.

- Operator X: B11 (UL:1427.9-1437.9 / DL:1475.9-1485.9 MHz), B3 (UL:1750-1765 / DL:1845-1860 MHz), n77 (3400-3440 / 3560-3600 / 3900-4000 MHz)

- Opeartor Y: B11 (UL:1437.9-1447.9 / DL:1485.9-1495.9 MHz), B3 (UL:1710-1730 / DL:1805-1825 MHz), n77 (3520-3560 / 3700-3800 / 4000-4100 MHz)

Then the own Rx impact can be simplified as below.

* IMD4 of (B3-n77) will fall into Rx band of Band 11.
* IMD5 of (B11-n77) will fall into Rx band of Band 3.

5.38.3 ∆TIB and ∆RIB values

The following relaxation values are proposed:

Table 5.38.3-1: ΔTIB,c

| Inter-band EN-DC configuration | E-UTRA or NR Band | ΔTIB,c (dB) |
| --- | --- | --- |
| DC\_3-11\_n77 | 3 | 0.8 |
| 11 | 0.9 |
| n77 | 0.8 |

Table 5.38.3-2: ΔRIB

|  |  |  |
| --- | --- | --- |
| Inter-band EN-DC configuration | NR Band | ΔRIB,c (dB) |
| DC\_3-11\_n77 | 3 | 0.3 |
| 11 | 0.5 |
| n77 | 0.5 |

5.38.4 Reference sensitivity exceptions

As mentioned above, IMD4 of B3 and n77 to Band11 Rx and IMD5 of B11 and n77 to Band3 Rx need to be addressed for REFSENS relaxation. Based on the exceptions of DC\_3-21\_n77, the following values are proposed:

Table 5.38.4-1: Reference sensitivity exceptions 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)** | **Duplex mode** | **IMD order** |
| DC\_3A-11A\_n77A  DC\_3A-11A\_n77(2A) | 3 | 1720 | 5 | 25 | 1815 | N/A | FDD | N/A |
| n77 | 3675 | 10 | 50 | 3675 | N/A | TDD | N/A |
| 11 | 1443 | 5 | 25 | 1491 | 8.8 | FDD | IMD4 |
| 11 | 1435.4 | 5 | 25 | 1483.4 | N/A | FDD | N/A |
| n77 | 3905 | 10 | 50 | 3905 | N/A | TDD | N/A |
| 3 | 1753 | 5 | 25 | 1848 | 3.4 | FDD | IMD5Y |
| Note Y: This band is also subject to IMD2 which is not specified. The frequency range below 3400MHz in n77 is not used for this combination. | | | | | | | | |

5.39 DC\_2-12\_n5

5.39.1 Operating bands for EN-DC

Table 5.39.1-1: Band combinations EN-DC (three bands)

| EN-DC band | E-UTRA CA band | NR band | Single UL allowed |
| --- | --- | --- | --- |
| 2-12\_n5 | CA\_2-12 | n5 |  |

### 5.39.2 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\_2A-12A\_n5A | DC\_2A\_n5A DC\_12A\_n5A | DC\_2A-12A | n5A |

5.39.3 ∆TIB and ∆RIB values

For DC\_2-12\_n5, the ΔTIB,c and ΔRIB,c values are reused from LTE combination CA\_2-5-12 and are given in the tables below.

**Table 5.39.3-1: ΔTIB,c**

| Inter-band DC Configuration | E-UTRA and NR Band | ΔTIB,c [dB] |
| --- | --- | --- |
| DC\_2-12\_n5 | 2 | 0.3 |
| 12 | 0.4 |
| n5 | 0.8 |

**Table 5.39.3-2: ΔRIB**

| Inter-band DC Configuration | E-UTRA and NR Band | ΔRIB [dB] |
| --- | --- | --- |
| DC\_2-12\_n5 | 2 | 0 |
| 12 | 0.3 |
| n5 | 0.5 |

5.39.4 REFSENS requirements

There is IMD5 impact from DC\_12\_n5 UL affecting band 2 DL. MSD derived from DC\_7A-28A\_n5A and DC\_20A\_n7A-n28A.

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\_2A-12A\_n5A | 2 | 1900 | 5 | 25 | 1980 | 5.9 | IMD5 |
| 12 | 705 | 5 | 25 | 735 | N/A | N/A |
| n5 | 840 | 5 | 25 | 885 | N/A | N/A |

5.40 DC\_2-5\_n12

5.40.1 Operating bands for EN-DC

Table 5.40.1-1: Band combinations EN-DC (three bands)

| EN-DC band | E-UTRA CA band | NR band | Single UL allowed |
| --- | --- | --- | --- |
| 2-5\_n12 | CA\_2-5 | n12 |  |

### 5.40.2 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\_2A-5A\_n12A | DC\_2A\_n12A DC\_5A\_n12A | DC\_2A-5A | n12A |

5.40.3 ∆TIB and ∆RIB values

For DC\_2-5\_n12, the ΔTIB,c and ΔRIB,c values are reused from LTE combination CA\_2-5-12 and are given in the tables below.

**Table 5.40.3-1: ΔTIB,c**

| Inter-band DC Configuration | E-UTRA and NR Band | ΔTIB,c [dB] |
| --- | --- | --- |
| DC\_2-5\_n12 | 2 | 0.3 |
| 5 | 0.8 |
| n12 | 0.4 |

**Table 5.40.3-2: ΔRIB**

| Inter-band DC Configuration | E-UTRA and NR Band | ΔRIB [dB] |
| --- | --- | --- |
| DC\_2-5\_n12 | 2 | 0 |
| 5 | 0.5 |
| n12 | 0.3 |

5.40.4 REFSENS requirements

There is IMD5 impact from DC\_5\_n12 UL affecting band 2 DL. MSD derived from DC\_7A-28A\_n5A and DC\_20A\_n7A-n28A.

Band 5 is also affected by IMD5 from UL DC\_2A\_n12A, but MSD value is not specified as there is only partial overlap of IMD5 with DL carrier

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\_2A-5A\_n12A6 | 2 | 1900 | 5 | 25 | 1980 | 5.9 | IMD5 |
| 5 | 840 | 5 | 25 | 885 | N/A | N/A |
| n12 | 705 | 5 | 25 | 735 | N/A | N/A |
| NOTE 6: Band 5 is also affected by IMD5 from UL DC\_2A\_n12A, but MSD value is not specified as there is only partial overlap of IMD5 with DL carrier | | | | | | | |

5.41 DC\_5-66\_n12

5.41.1 Operating bands for EN-DC

Table 5.41.1-1: Band combinations EN-DC (three bands)

| EN-DC band | E-UTRA CA band | NR band | Single UL allowed |
| --- | --- | --- | --- |
| 5-66\_n12 | CA\_5-66 | n12 |  |

### 5.41.2 Configuration for DC

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

| EN-DC  configuration | Uplink EN-DC  configuration  (NOTE 1) | E-UTRA CA configuration | NR band |
| --- | --- | --- | --- |
| DC\_5A-66A\_n12A | DC\_5A\_n12A DC\_66A\_n12A | DC\_5A-66A | n12A |

5.41.3 ∆TIB and ∆RIB values

For DC\_5-66\_n12, the ΔTIB,c and ΔRIB,c values are reused from LTE combination CA\_5-12-66 and are given in the tables below.

**Table 5.41.3-1: ΔTIB,c**

| Inter-band DC Configuration | E-UTRA and NR Band | ΔTIB,c [dB] |
| --- | --- | --- |
| DC\_5-66\_n12 | 5 | 0.3 |
| 66 | 0.8 |
| n12 | 0.8 |

**Table 5.41.3-2: ΔRIB**

| Inter-band DC Configuration | E-UTRA and NR Band | ΔRIB [dB] |
| --- | --- | --- |
| DC\_5-66\_n12 | 5 | 0 |
| 66 | 0.5 |
| n12 | 0.5 |

5.41.4 REFSENS requirements

There is no need to define MSD.

5.42 DC\_66\_(n)5

5.42.1 Operating bands for EN-DC

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

| EN-DC band | E-UTRA CA band | NR band | Single UL allowed |
| --- | --- | --- | --- |
| DC\_66-(n)5 | CA\_66-5 | n5 |  |

### 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\_66A-(n)5AA | DC\_66A\_n5A  DC\_(n)5AA1 | CA\_66A-5A | n5A |
| NOTE1: Only single switched UL is supported | | | |

5.42.3 ∆TIB and ∆RIB values

For DC\_66\_(n)5 the ΔTIB,c and ΔRIB,c values are derived from DC\_66\_n5 combination.

Table 5..1.62.4-1: ΔTIB,c

| E-UTRA and NR DC Configuration | E-UTRA and NR Band | ΔTIB,c [dB] |
| --- | --- | --- |
| DC\_66\_(n)5 | 5 | 0.3 |
| n5 | 0.3 |
| 66 | 0.3 |

Table 5.1.116.4-2: ΔRIB,c

| E-UTRA and NR DC Configuration | E-UTRA and NR Band | ΔRIB,c [dB] |
| --- | --- | --- |
| DC\_66\_(n)5 | 5 | 0 |
| n5 | 0 |
| 66 | 0 |

5.42.4 REFSENS requirements

No additional REFSENS requirement is needed.

5.43 DC\_12-66\_n5

5.43.1 Operating bands for EN-DC

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

| EN-DC band | E-UTRA CA band | NR band | Single UL allowed |
| --- | --- | --- | --- |
| 12-66\_n5 | CA\_12-66 | n5 |  |

### 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\_12A-66A\_n5A | DC\_12A\_n5A DC\_66A\_n5A | DC\_12A-66A | n5A |

5.43.3 ∆TIB and ∆RIB values

For DC\_12-66\_n5, the ΔTIB,c and ΔRIB,c values are reused from LTE combination CA\_5-12-66 and are given in the tables below.

**Table 5.43.3-1: ΔTIB,c**

| Inter-band DC Configuration | E-UTRA and NR Band | ΔTIB,c [dB] |
| --- | --- | --- |
| DC\_12-66\_n5 | 12 | 0.8 |
| 66 | 0.8 |
| n5 | 0.3 |

**Table 5.43.3-2: ΔRIB**

| Inter-band DC Configuration | E-UTRA and NR Band | ΔRIB [dB] |
| --- | --- | --- |
| DC\_12-66\_n5 | 12 | 0.5 |
| 66 | 0.5 |
| n5 | 0 |

5.43.4 REFSENS requirements

There is IMD4 impact from DC\_66\_n5 UL affecting band 12 DL. MSD derived from DC\_3A-28A\_n5A.

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\_12A-66A\_n5A | 12 | 712 | 5 | 25 | 742 | 9.4 | IMD4 |
| 66 | 1745 | 5 | 25 | 2145 | N/A | N/A |
| n5 | 829 | 5 | 25 | 874 | N/A | N/A |

## 5.44 DC\_7-8\_n28

5.44.1 Operating bands for DC

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

| EN-DC band | E-UTRA CA band | NR band |
| --- | --- | --- |
| DC\_7-8\_n28 | CA\_7-8 | n28 |

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\_7A-8A\_n28A | DC\_7A\_n28A DC\_8A\_n28A | CA\_7-8 | n28 |

5.44.3 Co-existence studies

For UE coexistence study of Band 8 + Band n28, the 2nd, 3rd, 4th and 5th order harmonics and 2nd, 3rd, 4th and 5th order intermodulation products were calculated and presented in Table 5.44.3-1.

Table 5.44.3-1: Harmonic and IMD analysis

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **UE UL carriers** | **fx\_low** | **fx\_high** | **fy\_low** | **fy\_high** |
| UL frequency (MHz) | 880 | 915 | 703 | 748 |
| 2nd harmonics frequency limits | 2\*fx\_low | 2\*fx\_high | 2\* fy\_low | 2\* fy\_high |
| 2nd harmonics frequency limits (MHz) | 1760 | 1830 | 1406 | 1496 |
| 3rd harmonics frequency limits | 3\*fx\_low | 3\*fx\_high | 3\* fy\_low | 3\* fy\_high |
| 3rd harmonics frequency limits (MHz) | 2640 | 2745 | 2109 | 2244 |
| 4th harmonics frequency limits | 4\*fx\_low | 4\*fx\_high | 4\* fy\_low | 4\* fy\_high |
| 4th harmonics frequency limits (MHz) | 3520 | 3660 | 2812 | 2992 |
| 5th harmonics frequency limits | 5\*fx\_low | 5\*fx\_high | 5\* fy\_low | 5\* fy\_high |
| 5th harmonics frequency limits (MHz) | 4400 | 4575 | 3515 | 3740 |
| 2nd order IMD products | |fy\_low – fx\_high| | |fy\_high – fx\_low| | |fy\_low + fx\_low| | |fy\_high + fx\_high| |
| IMD frequency limits (MHz) | 212 | 132 | 1583 | 1663 |
| 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) | 1012 | 1127 | 491 | 616 |
| 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) | 2463 | 2578 | 2286 | 2411 |
| 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) | 1892 | 2042 | 1194 | 1364 |
| 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) | 3343 | 3493 | 2989 | 3159 |
| 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) | 264 | 424 | 3166 | 3326 |
| 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) | 2112 | 1897 | 2957 | 2772 |
| 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) | 484 | 279 | 1339 | 1144 |
| 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) | 3692 | 3907 | 4223 | 4408 |
| 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) | 3869 | 4074 | 4046 | 4241 |

For UE coexistence study of Band 7 + Band n28, the 2nd, 3rd, 4th and 5th order harmonics and 2nd, 3rd, 4th and 5th order intermodulation products were calculated and presented in Table 5.44.3-1.

Table 5.44.3-2: Harmonic and IMD analysis

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **UE UL carriers** | **fx\_low** | **fx\_high** | **fy\_low** | **fy\_high** |
| UL frequency (MHz) | 2500 | 2570 | 703 | 748 |
| 2nd harmonics frequency limits | 2\*fx\_low | 2\*fx\_high | 2\* fy\_low | 2\* fy\_high |
| 2nd harmonics frequency limits (MHz) | 5000 | 5140 | 1406 | 1496 |
| 3rd harmonics frequency limits | 3\*fx\_low | 3\*fx\_high | 3\* fy\_low | 3\* fy\_high |
| 3rd harmonics frequency limits (MHz) | 7500 | 7710 | 2109 | 2244 |
| 4th harmonics frequency limits | 4\*fx\_low | 4\*fx\_high | 4\* fy\_low | 4\* fy\_high |
| 4th harmonics frequency limits (MHz) | 10000 | 10280 | 2812 | 2992 |
| 5th harmonics frequency limits | 5\*fx\_low | 5\*fx\_high | 5\* fy\_low | 5\* fy\_high |
| 5th harmonics frequency limits (MHz) | 12500 | 12850 | 3515 | 3740 |
| 2nd order IMD products | |fy\_low – fx\_high| | |fy\_high – fx\_low| | |fy\_low + fx\_low| | |fy\_high + fx\_high| |
| IMD frequency limits (MHz) | 1867 | 1752 | 3203 | 3318 |
| 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) | 4252 | 4437 | 1164 | 1004 |
| 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) | 5703 | 5888 | 3906 | 4066 |
| 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) | 6752 | 7007 | 461 | 256 |
| 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) | 8203 | 8458 | 4609 | 4814 |
| 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) | 3504 | 3734 | 6406 | 6636 |
| 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) | 492 | 242 | 9577 | 9252 |
| 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) | 2756 | 3031 | 6304 | 6004 |
| 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) | 5312 | 5562 | 10703 | 11028 |
| 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) | 7109 | 7384 | 8906 | 9206 |

There is no IMD issue for Rx of band 7 with UL DC\_8\_n28.

There is no IMD issue for Rx of band 8 with UL DC\_7\_n28.

5.44.4 ∆TIB and ∆RIB values

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

| Inter-band DC Configuration | E-UTRA and NR Band | ΔTIB,c [dB] |
| --- | --- | --- |
| DC\_7-8\_n28 | 7 | 0.3 |
| 8 | 0.6 |
| n28 | 0.5 |

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

| Inter-band DC Configuration | E-UTRA and NR Band | ΔRIB [dB] |
| --- | --- | --- |
| DC\_7-8\_n28 | 7 | 0 |
| 8 | 0.2 |
| n28 | 0.1 |

5.44.5 REFSENS requirements

There is no reference sensitivity exception (MSD) for DC\_7-8\_n28.

## 5.45 DC\_20-28\_n3

5.45.1 Operating bands for DC

Table 5.45.1-1: Band combinations EN-DC (three bands)

| EN-DC band | E-UTRA CA band | NR band |
| --- | --- | --- |
| DC\_20-28\_n3 | CA\_20-28 | n3 |

5.45.2 Configuration for DC

Table 5.45.2-1: Inter-band EN-DC configurations (three bands)

| EN-DC  configuration | Uplink EN-DC  configuration  (NOTE 1) | E-UTRA CA configuration | NR band |
| --- | --- | --- | --- |
| DC\_20A-28A\_n3A | DC\_20A\_n3A DC\_28A\_n3A | CA\_20-28 | n3 |

5.45.3 Co-existence studies

For UE coexistence study of Band 20 + Band n3, the 2nd, 3rd, 4th and 5th order harmonics and 2nd, 3rd, 4th and 5th order intermodulation products were calculated and presented in Table 5.45.3-1.

Table 5.45.3-1: Harmonic and IMD analysis

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **UE UL carriers** | **fx\_low** | **fx\_high** | **fy\_low** | **fy\_high** |
| UL frequency (MHz) | 832 | 862 | 1710 | 1785 |
| 2nd harmonics frequency limits | 2\*fx\_low | 2\*fx\_high | 2\* fy\_low | 2\* fy\_high |
| 2nd harmonics frequency limits (MHz) | 1664 | 1724 | 3420 | 3570 |
| 3rd harmonics frequency limits | 3\*fx\_low | 3\*fx\_high | 3\* fy\_low | 3\* fy\_high |
| 3rd harmonics frequency limits (MHz) | 2496 | 2586 | 5130 | 5355 |
| 4th harmonics frequency limits | 4\*fx\_low | 4\*fx\_high | 4\* fy\_low | 4\* fy\_high |
| 4th harmonics frequency limits (MHz) | 3328 | 3448 | 6840 | 7140 |
| 5th harmonics frequency limits | 5\*fx\_low | 5\*fx\_high | 5\* fy\_low | 5\* fy\_high |
| 5th harmonics frequency limits (MHz) | 4160 | 4310 | 8550 | 8925 |
| 2nd order IMD products | |fy\_low – fx\_high| | |fy\_high – fx\_low| | |fy\_low + fx\_low| | |fy\_high + fx\_high| |
| IMD frequency limits (MHz) | 848 | 953 | 2542 | 2647 |
| 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) | 121 | 14 | 2558 | 2738 |
| 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) | 3374 | 3509 | 4252 | 4432 |
| 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) | 711 | 876 | 4268 | 4523 |
| 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) | 4206 | 4371 | 5962 | 6217 |
| 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) | 1906 | 1696 | 5084 | 5294 |
| 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) | 6308 | 5978 | 1738 | 1543 |
| 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) | 3691 | 3406 | 834 | 1074 |
| 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) | 7672 | 8002 | 5038 | 5233 |
| 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) | 6794 | 7079 | 5916 | 6156 |

For UE coexistence study of Band 28 + Band n3, the 2nd, 3rd, 4th and 5th order harmonics and 2nd, 3rd, 4th and 5th order intermodulation products were calculated and presented in Table 5.45.3-1.

Table 5.45.3-2: Harmonic and IMD analysis

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **UE UL carriers** | **fx\_low** | **fx\_high** | **fy\_low** | **fy\_high** |
| UL frequency (MHz) | 703 | 748 | 1710 | 1785 |
| 2nd harmonics frequency limits | 2\*fx\_low | 2\*fx\_high | 2\* fy\_low | 2\* fy\_high |
| 2nd harmonics frequency limits (MHz) | 1406 | 1496 | 3420 | 3570 |
| 3rd harmonics frequency limits | 3\*fx\_low | 3\*fx\_high | 3\* fy\_low | 3\* fy\_high |
| 3rd harmonics frequency limits (MHz) | 2109 | 2244 | 5130 | 5355 |
| 4th harmonics frequency limits | 4\*fx\_low | 4\*fx\_high | 4\* fy\_low | 4\* fy\_high |
| 4th harmonics frequency limits (MHz) | 2812 | 2992 | 6840 | 7140 |
| 5th harmonics frequency limits | 5\*fx\_low | 5\*fx\_high | 5\* fy\_low | 5\* fy\_high |
| 5th harmonics frequency limits (MHz) | 3515 | 3740 | 8550 | 8925 |
| 2nd order IMD products | |fy\_low – fx\_high| | |fy\_high – fx\_low| | |fy\_low + fx\_low| | |fy\_high + fx\_high| |
| IMD frequency limits (MHz) | 962 | 1082 | 2413 | 2533 |
| 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) | 379 | 214 | 2672 | 2867 |
| 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) | 3116 | 3281 | 4123 | 4318 |
| 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) | 324 | 534 | 4382 | 4652 |
| 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) | 3819 | 4029 | 5833 | 6103 |
| 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) | 2164 | 1924 | 4826 | 5066 |
| 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) | 6437 | 6092 | 1282 | 1027 |
| 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) | 3949 | 3634 | 1176 | 1461 |
| 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) | 7543 | 7888 | 4522 | 4777 |
| 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) | 6536 | 6851 | 5529 | 5814 |

IMD4 may fall into Rx of band 28 with UL DC\_20\_n3.

5.45.4 ∆TIB and ∆RIB values

Table 5.45.4-1: ΔTIB,c due to EN-DC(three bands)

| Inter-band DC Configuration | E-UTRA and NR Band | ΔTIB,c [dB] |
| --- | --- | --- |
| DC\_20-28\_n3 | 2 | 0.5 |
| 28 | 0.6 |
| n3 | 0.5 |

**Table 5.45.4-2: ΔRIB,c due to EN-DC (three bands)**

| Inter-band DC Configuration | E-UTRA and NR Band | ΔRIB [dB] |
| --- | --- | --- |
| DC\_20-28\_n3 | 2 | 0.3 |
| 28 | 0.2 |
| n3 | 0.3 |

5.45.5 REFSENS requirements

The reference sensitivity exception (MSD) due to IMD4 for DC\_20-28\_n3 with UL DC\_20\_n3 is specified as below referring to the MSD for DC\_3A-28A\_n5A from 38.101-3.

Table 5.45.5-1: 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\_20A-28A\_n3A | 20 | 845 | 5 | 25 | 804 | N/A | N/A |
| 28 | 730 | 5 | 25 | 785 | 9.4 | IMD4 |
| n3 | 1750 | 5 | 25 | 1845 | N/A | N/A |
|  | | | | | | | |

## 5.46 DC\_28-66\_n66

5.46.1 Operating bands for DC

Table 5.46.1-1: Band combinations EN-DC (three bands)

| EN-DC band | E-UTRA CA band | NR band |
| --- | --- | --- |
| DC\_28-66\_n66 | CA\_28-66 | n66 |

5.46.2 Configuration for DC

Table 5.46.2-1: Inter-band EN-DC configurations (three bands)

| EN-DC  configuration | Uplink EN-DC  configuration  (NOTE 1) | E-UTRA CA configuration | NR band |
| --- | --- | --- | --- |
| DC\_28A-66A\_n66A | DC\_28A\_n66A  DC\_66A\_n66A2 | CA\_28-66 | n66 |
| NOTE 2: Only single switched UL is supported | | | |

5.46.3 Co-existence studies

For UE coexistence study of Band 28 + Band n66, the 2nd, 3rd, 4th and 5th order harmonics and 2nd, 3rd, 4th and 5th order intermodulation products were calculated and presented in Table 5.46.3-1.

Table 5.46.3-1: Harmonic and IMD analysis

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **UE UL carriers** | **fx\_low** | **fx\_high** | **fy\_low** | **fy\_high** |
| UL frequency (MHz) | 703 | 748 | 1710 | 1780 |
| 2nd harmonics frequency limits | 2\*fx\_low | 2\*fx\_high | 2\* fy\_low | 2\* fy\_high |
| 2nd harmonics frequency limits (MHz) | 1406 | 1496 | 3420 | 3560 |
| 3rd harmonics frequency limits | 3\*fx\_low | 3\*fx\_high | 3\* fy\_low | 3\* fy\_high |
| 3rd harmonics frequency limits (MHz) | 2109 | 2244 | 5130 | 5340 |
| 4th harmonics frequency limits | 4\*fx\_low | 4\*fx\_high | 4\* fy\_low | 4\* fy\_high |
| 4th harmonics frequency limits (MHz) | 2812 | 2992 | 6840 | 7120 |
| 5th harmonics frequency limits | 5\*fx\_low | 5\*fx\_high | 5\* fy\_low | 5\* fy\_high |
| 5th harmonics frequency limits (MHz) | 3515 | 3740 | 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) | 962 | 1077 | 2413 | 2528 |
| 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) | 374 | 214 | 2672 | 2857 |
| 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) | 3116 | 3276 | 4123 | 4308 |
| 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) | 329 | 534 | 4382 | 4637 |
| 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) | 3819 | 4024 | 5833 | 6088 |
| 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) | 2154 | 1924 | 4826 | 5056 |
| 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) | 6417 | 6092 | 1282 | 1032 |
| 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) | 3934 | 3634 | 1176 | 1451 |
| 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) | 7543 | 7868 | 4522 | 4772 |
| 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) | 6536 | 6836 | 5529 | 5804 |

For UL DC\_66A\_n66A, there is no need to study the IMD since only single switched UL is supported.

IMD4 may fall into Rx of band 66 with UL DC\_28\_n66.

5.46.4 ∆TIB and ∆RIB values

Table 5.46.4-1: ΔTIB,c due to EN-DC(three bands)

| Inter-band DC Configuration | E-UTRA and NR Band | ΔTIB,c [dB] |
| --- | --- | --- |
| DC\_28-66\_n66 | 28 | 0.6 |
| 66 | 0.3 |
| n66 | 0.3 |

**Table 5.46.4-2: ΔRIB,c due to EN-DC (three bands)**

| Inter-band DC Configuration | E-UTRA and NR Band | ΔRIB [dB] |
| --- | --- | --- |
| DC\_28-66\_n66 | 28 | 0.2 |
| 66 | 0 |
| n66 | 0 |

5.46.5 REFSENS requirements

The reference sensitivity exception (MSD) due to IMD4 for DC\_28-66\_n66 with UL DC\_28\_n66 is specified as below referring to the MSD for DC\_1A-3A\_n28A from 38.101-3.

Table 5.46.5-1: 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-66A\_n66A | 28 | 710.5 | 5 | 25 | 765.5 | N/A | N/A |
| 66 | 1729 | 5 | 25 | 2129 | 11.0 | IMD4 |
| n66 | 1775 | 5 | 25 | 2175 | N/A | N/A |
|  | | | | | | | |

## 5.47 DC\_7-28\_n66

5.47.1 Operating bands for DC

Table 5.47.1-1: Band combinations EN-DC (three bands)

| EN-DC band | E-UTRA CA band | NR band |
| --- | --- | --- |
| DC\_7-28\_n66 | CA\_7-28 | n66 |

5.47.2 Configuration for DC

Table 5.47.2-1: Inter-band EN-DC configurations (three bands)

| EN-DC  configuration | Uplink EN-DC  configuration  (NOTE 1) | E-UTRA CA configuration | NR band |
| --- | --- | --- | --- |
| DC\_7A-28A\_n66A  DC\_7C-28A\_n66A | DC\_7A\_n66A DC\_28A\_n66A | CA\_7-28 | n66 |

5.47.3 Co-existence studies

For UE coexistence study of Band 28 + Band n66, the 2nd, 3rd, 4th and 5th order harmonics and 2nd, 3rd, 4th and 5th order intermodulation products were calculated and presented in Table 5.47.3-1.

Table 5.47.3-1: Harmonic and IMD analysis

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **UE UL carriers** | **fx\_low** | **fx\_high** | **fy\_low** | **fy\_high** |
| UL frequency (MHz) | 703 | 748 | 1710 | 1780 |
| 2nd harmonics frequency limits | 2\*fx\_low | 2\*fx\_high | 2\* fy\_low | 2\* fy\_high |
| 2nd harmonics frequency limits (MHz) | 1406 | 1496 | 3420 | 3560 |
| 3rd harmonics frequency limits | 3\*fx\_low | 3\*fx\_high | 3\* fy\_low | 3\* fy\_high |
| 3rd harmonics frequency limits (MHz) | 2109 | 2244 | 5130 | 5340 |
| 4th harmonics frequency limits | 4\*fx\_low | 4\*fx\_high | 4\* fy\_low | 4\* fy\_high |
| 4th harmonics frequency limits (MHz) | 2812 | 2992 | 6840 | 7120 |
| 5th harmonics frequency limits | 5\*fx\_low | 5\*fx\_high | 5\* fy\_low | 5\* fy\_high |
| 5th harmonics frequency limits (MHz) | 3515 | 3740 | 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) | 962 | 1077 | 2413 | 2528 |
| 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) | 374 | 214 | 2672 | 2857 |
| 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) | 3116 | 3276 | 4123 | 4308 |
| 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) | 329 | 534 | 4382 | 4637 |
| 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) | 3819 | 4024 | 5833 | 6088 |
| 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) | 2154 | 1924 | 4826 | 5056 |
| 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) | 6417 | 6092 | 1282 | 1032 |
| 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) | 3934 | 3634 | 1176 | 1451 |
| 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) | 7543 | 7868 | 4522 | 4772 |
| 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) | 6536 | 6836 | 5529 | 5804 |

For UE coexistence study of Band 7 + Band n66, the 2nd, 3rd, 4th and 5th order harmonics and 2nd, 3rd, 4th and 5th order intermodulation products were calculated and presented in Table 5.47.3-1.

Table 5.47.3-2: Harmonic and IMD analysis

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **UE UL carriers** | **fx\_low** | **fx\_high** | **fy\_low** | **fy\_high** |
| UL frequency (MHz) | 2500 | 2570 | 1710 | 1780 |
| 2nd harmonics frequency limits | 2\*fx\_low | 2\*fx\_high | 2\* fy\_low | 2\* fy\_high |
| 2nd harmonics frequency limits (MHz) | 5000 | 5140 | 3420 | 3560 |
| 3rd harmonics frequency limits | 3\*fx\_low | 3\*fx\_high | 3\* fy\_low | 3\* fy\_high |
| 3rd harmonics frequency limits (MHz) | 7500 | 7710 | 5130 | 5340 |
| 4th harmonics frequency limits | 4\*fx\_low | 4\*fx\_high | 4\* fy\_low | 4\* fy\_high |
| 4th harmonics frequency limits (MHz) | 10000 | 10280 | 6840 | 7120 |
| 5th harmonics frequency limits | 5\*fx\_low | 5\*fx\_high | 5\* fy\_low | 5\* fy\_high |
| 5th harmonics frequency limits (MHz) | 12500 | 12850 | 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) | 860 | 720 | 4210 | 4350 |
| 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) | 3220 | 3430 | 850 | 1060 |
| 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) | 6710 | 6920 | 5920 | 6130 |
| 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) | 5720 | 6000 | 2560 | 2840 |
| 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) | 9210 | 9490 | 7630 | 7910 |
| 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 | 1720 | 8420 | 8700 |
| 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) | 4620 | 4270 | 8570 | 8220 |
| 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) | 340 | 10 | 4290 | 3940 |
| 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) | 9340 | 9690 | 11710 | 12060 |
| 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) | 10130 | 10480 | 10920 | 11270 |

IMD3 may fall into Rx of band 7 with UL DC\_28\_n66.

IMD2 may fall into Rx of band 28 with UL DC\_7\_n66.

5.47.4 ∆TIB and ∆RIB values

Table 5.47.4-1: ΔTIB,c due to EN-DC(three bands)

| Inter-band DC Configuration | E-UTRA and NR Band | ΔTIB,c [dB] |
| --- | --- | --- |
| DC\_7-28\_n66 | 7 | 0.5 |
| 28 | 0.6 |
| n66 | 0.5 |

**Table 5.47.4-2: ΔRIB,c due to EN-DC (three bands)**

| Inter-band DC Configuration | E-UTRA and NR Band | ΔRIB [dB] |
| --- | --- | --- |
| DC\_7-28\_n66 | 7 | 0 |
| 28 | 0.2 |
| n66 | 0 |

5.47.5 REFSENS requirements

The reference sensitivity exception (MSD) due to IMD3 for DC\_7-28\_n66 with UL DC\_28\_n66 is specified as below referring to the MSD for DC\_3A-7A\_n28A from 38.101-3.

The reference sensitivity exception (MSD) due to IMD2 for DC\_7-28\_n66 with UL DC\_7\_n66 is specified as below referring to the MSD for DC\_3A\_n7A-n28A from 38.101-3.

Table 5.47.5-1: 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\_7A-28A\_n66A  DC\_7C-28A\_n66A | 7 | 2562 | 10 | 50 | 2682 | 16.9 | IMD3 |
| 28 | 743 | 5 | 25 | 798 | N/A | N/A |
| n66 | 1712.5 | 5 | 25 | 2112.5 | N/A | N/A |
| 7 | 2543 | 5 | 25 | 2663 | N/A | N/A |
| 28 | 741 | 5 | 25 | 796 | 20.0 | IMD2 |
| n66 | 1747 | 5 | 25 | 2147 | N/A | N/A |
|  | | | | | | | |

## 5.48 DC\_2-28\_n66

5.48.1 Operating bands for DC

Table 5.48.1-1: Band combinations EN-DC (three bands)

| EN-DC band | E-UTRA CA band | NR band |
| --- | --- | --- |
| DC\_2-28\_n66 | CA\_2-28 | n66 |

5.48.2 Configuration for DC

Table 5.48.2-1: Inter-band EN-DC configurations (three bands)

| EN-DC  configuration | Uplink EN-DC  configuration  (NOTE 1) | E-UTRA CA configuration | NR band |
| --- | --- | --- | --- |
| DC\_2A-28A\_n66A | DC\_2A\_n66A DC\_28A\_n66A | CA\_2-28 | n66 |

5.48.3 Co-existence studies

For UE coexistence study of Band 28 + Band n66, the 2nd, 3rd, 4th and 5th order harmonics and 2nd, 3rd, 4th and 5th order intermodulation products were calculated and presented in Table 5.48.3-1.

Table 5.48.3-1: Harmonic and IMD analysis

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **UE UL carriers** | **fx\_low** | **fx\_high** | **fy\_low** | **fy\_high** |
| UL frequency (MHz) | 703 | 748 | 1710 | 1780 |
| 2nd harmonics frequency limits | 2\*fx\_low | 2\*fx\_high | 2\* fy\_low | 2\* fy\_high |
| 2nd harmonics frequency limits (MHz) | 1406 | 1496 | 3420 | 3560 |
| 3rd harmonics frequency limits | 3\*fx\_low | 3\*fx\_high | 3\* fy\_low | 3\* fy\_high |
| 3rd harmonics frequency limits (MHz) | 2109 | 2244 | 5130 | 5340 |
| 4th harmonics frequency limits | 4\*fx\_low | 4\*fx\_high | 4\* fy\_low | 4\* fy\_high |
| 4th harmonics frequency limits (MHz) | 2812 | 2992 | 6840 | 7120 |
| 5th harmonics frequency limits | 5\*fx\_low | 5\*fx\_high | 5\* fy\_low | 5\* fy\_high |
| 5th harmonics frequency limits (MHz) | 3515 | 3740 | 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) | 962 | 1077 | 2413 | 2528 |
| 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) | 374 | 214 | 2672 | 2857 |
| 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) | 3116 | 3276 | 4123 | 4308 |
| 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) | 329 | 534 | 4382 | 4637 |
| 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) | 3819 | 4024 | 5833 | 6088 |
| 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) | 2154 | 1924 | 4826 | 5056 |
| 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) | 6417 | 6092 | 1282 | 1032 |
| 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) | 3934 | 3634 | 1176 | 1451 |
| 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) | 7543 | 7868 | 4522 | 4772 |
| 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) | 6536 | 6836 | 5529 | 5804 |

For UE coexistence study of Band 2 + Band n66, the 2nd, 3rd, 4th and 5th order harmonics and 2nd, 3rd, 4th and 5th order intermodulation products were calculated and presented in Table 5.48.3-1.

Table 5.48.3-2: Harmonic and IMD analysis

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **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 |

IMD4 may fall into Rx of band 2 with UL DC\_28\_n66.

There is no IMD issue for Rx of band 28 with UL DC\_2\_n66.

5.48.4 ∆TIB and ∆RIB values

Table 5.48.4-1: ΔTIB,c due to EN-DC(three bands)

| Inter-band DC Configuration | E-UTRA and NR Band | ΔTIB,c [dB] |
| --- | --- | --- |
| DC\_2-28\_n66 | 2 | 0.5 |
| 28 | 0.6 |
| n66 | 0.5 |

**Table 5.48.4-2: ΔRIB,c due to EN-DC (three bands)**

| Inter-band DC Configuration | E-UTRA and NR Band | ΔRIB [dB] |
| --- | --- | --- |
| DC\_2-28\_n66 | 2 | 0.3 |
| 28 | 0.2 |
| n66 | 0.3 |

5.48.5 REFSENS requirements

The reference sensitivity exception (MSD) due to IMD4 for DC\_2-28\_n66 with UL DC\_28\_n66 is specified as below referring to the MSD for DC\_1A-3A\_n28A from 38.101-3.

Table 5.48.5-1: 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-28A\_n66A | 2 | 1900 | 5 | 25 | 1980 | 11 | IMD4 |
| 28 | 730 | 5 | 25 | 785 | N/A | N/A |
| n66 | 1720 | 5 | 25 | 2120 | N/A | N/A |
|  | | | | | | | |

## 5.49 Void



























## 5.50 Void



























## 5.51 DC\_8-40\_n1

5.51.1 Operating bands for DC

Table 5.51.1-1: Band combinations EN-DC (three bands)

| EN-DC band | E-UTRA CA band | NR band |
| --- | --- | --- |
| DC\_8-40\_n1 | CA\_8-40 | n1 |

5.51.2 Configuration for DC

Table 5.51.2-1: Inter-band EN-DC configurations (three bands)

| EN-DC  configuration | Uplink EN-DC  configuration  (NOTE 1) | E-UTRA CA configuration | NR band |
| --- | --- | --- | --- |
| DC\_8A-40A\_n1A  DC\_8A-40C\_n1A | DC\_8A\_n1A DC\_40A\_n1A | CA\_8-40 | n1 |

5.51.3 Co-existence studies

For UE coexistence study of Band 8 + Band n1, the 2nd, 3rd, 4th and 5th order harmonics and 2nd, 3rd, 4th and 5th order intermodulation products were calculated and presented in Table 5.51.3-1.

Table 5.51.3-1: Harmonic and IMD analysis

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **UE UL carriers** | **fx\_low** | **fx\_high** | **fy\_low** | **fy\_high** |
| UL frequency (MHz) | 1920 | 1980 | 880 | 915 |
| 2nd harmonics frequency limits | 2\*fx\_low | 2\*fx\_high | 2\* fy\_low | 2\* fy\_high |
| 2nd harmonics frequency limits (MHz) | 3840 | 3960 | 1760 | 1830 |
| 3rd harmonics frequency limits | 3\*fx\_low | 3\*fx\_high | 3\* fy\_low | 3\* fy\_high |
| 3rd harmonics frequency limits (MHz) | 5760 | 5940 | 2640 | 2745 |
| 4th harmonics frequency limits | 4\*fx\_low | 4\*fx\_high | 4\* fy\_low | 4\* fy\_high |
| 4th harmonics frequency limits (MHz) | 7680 | 7920 | 3520 | 3660 |
| 5th harmonics frequency limits | 5\*fx\_low | 5\*fx\_high | 5\* fy\_low | 5\* fy\_high |
| 5th harmonics frequency limits (MHz) | 9600 | 9900 | 4400 | 4575 |
| 2nd order IMD products | |fy\_low – fx\_high| | |fy\_high – fx\_low| | |fy\_low + fx\_low| | |fy\_high + fx\_high| |
| IMD frequency limits (MHz) | 1100 | 1005 | 2800 | 2895 |
| 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) | 2925 | 3080 | 220 | 90 |
| 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) | 4720 | 4875 | 3680 | 3810 |
| 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) | 4845 | 5060 | 660 | 825 |
| 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) | 6640 | 6855 | 4560 | 4725 |
| 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) | 2010 | 2200 | 5600 | 5790 |
| 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) | 1740 | 1540 | 7040 | 6765 |
| 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) | 1095 | 1320 | 4180 | 3930 |
| 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) | 5440 | 5640 | 8560 | 8835 |
| 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) | 6480 | 6705 | 7520 | 7770 |

For UE coexistence study of Band 40 + Band n1, the 2nd, 3rd, 4th and 5th order harmonics and 2nd, 3rd, 4th and 5th order intermodulation products were calculated and presented in Table 5.51.3-1.

Table 5.51.3-2: Harmonic and IMD analysis

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **UE UL carriers** | **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 |
| 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 | |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 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 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 |

IMD4 may fall into Rx of band 8 with UL DC\_40\_n1.

5.51.4 ∆TIB and ∆RIB values

Table 5.51.4-1: ΔTIB,c due to EN-DC(three bands)

| Inter-band DC Configuration | E-UTRA and NR Band | ΔTIB,c [dB] |
| --- | --- | --- |
| DC\_8-40\_n1 | 8 | 0.3 |
| 40 | 0.5 |
| n1 | 0.3 |

**Table 5.51.4-2: ΔRIB,c due to EN-DC (three bands)**

| Inter-band DC Configuration | E-UTRA and NR Band | ΔRIB [dB] |
| --- | --- | --- |
| DC\_8-40\_n1 | 8 | 0.2 |
| 40 | 0.5 |
| n1 | 0 |

5.51.5 REFSENS requirements

The reference sensitivity exception (MSD) due to IMD4 for DC\_8-40\_n1 with UL DC\_40\_n1 is specified as below referring to the MSD for DC\_1A\_n8A-n40A from 38.101-3.

Table 5.51.5-1: 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\_8A-40A\_n1A  DC\_8A-40C\_n1A | 8 | 885 | 5 | 25 | 930 | 8.0 | IMD4 |
| 40 | 2395 | 5 | 25 | 2395 | N/A | N/A |
| n1 | 1930 | 5 | 25 | 2120 | N/A | N/A |
|  | | | | | | | |

## 5.52 DC\_1-32\_n3

5.52.1 Operating bands for DC

Table 5.52.1-1: Band combinations EN-DC (three bands)

| EN-DC band | E-UTRA CA band | NR band |
| --- | --- | --- |
| DC\_1-32\_n3 | CA\_1-32 | n3 |

5.52.2 Configuration for DC

Table 5.52.2-1: Inter-band EN-DC configurations (three bands)

| EN-DC  configuration | Uplink EN-DC  configuration  (NOTE 1) | E-UTRA CA configuration | NR band |
| --- | --- | --- | --- |
| DC\_1A-32A\_n3A | DC\_1A\_n3A | CA\_1-32 | n3 |

5.52.3 Co-existence studies

For UE coexistence study of Band 1 + Band n3, the 2nd, 3rd, 4th and 5th order harmonics and 2nd, 3rd, 4th and 5th order intermodulation products were calculated and presented in Table 5.52.3-1.

Table 5.52.3-1: Harmonic and IMD analysis

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **UE UL carriers** | **fx\_low** | **fx\_high** | **fy\_low** | **fy\_high** |
| UL frequency (MHz) | 1920 | 1980 | 1710 | 1785 |
| 2nd harmonics frequency limits | 2\*fx\_low | 2\*fx\_high | 2\* fy\_low | 2\* fy\_high |
| 2nd harmonics frequency limits (MHz) | 3840 | 3960 | 3420 | 3570 |
| 3rd harmonics frequency limits | 3\*fx\_low | 3\*fx\_high | 3\* fy\_low | 3\* fy\_high |
| 3rd harmonics frequency limits (MHz) | 5760 | 5940 | 5130 | 5355 |
| 4th harmonics frequency limits | 4\*fx\_low | 4\*fx\_high | 4\* fy\_low | 4\* fy\_high |
| 4th harmonics frequency limits (MHz) | 7680 | 7920 | 6840 | 7140 |
| 5th harmonics frequency limits | 5\*fx\_low | 5\*fx\_high | 5\* fy\_low | 5\* fy\_high |
| 5th harmonics frequency limits (MHz) | 9600 | 9900 | 8550 | 8925 |
| 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 | 135 | 3630 | 3765 |
| 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) | 2055 | 2250 | 1440 | 1650 |
| 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) | 5550 | 5745 | 5340 | 5550 |
| 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) | 3975 | 4230 | 3150 | 3435 |
| 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) | 7470 | 7725 | 7050 | 7335 |
| 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) | 270 | 540 | 7260 | 7530 |
| 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) | 5220 | 4860 | 6210 | 5895 |
| 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) | 1515 | 1170 | 2520 | 2190 |
| 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) | 8760 | 9120 | 9390 | 9705 |
| 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) | 8970 | 9315 | 9180 | 9510 |

IMD3 and IMD5 may fall into Rx of band 32 with UL DC\_1\_n3.

5.52.4 ∆TIB and ∆RIB values

Table 5.52.4-1: ΔTIB,c due to EN-DC(three bands)

| Inter-band DC Configuration | E-UTRA and NR Band | ΔTIB,c [dB] |
| --- | --- | --- |
| DC\_1-32\_n3 | 1 | 0.5 |
| n3 | 0.5 |

**Table 5.52.4-2: ΔRIB,c due to EN-DC (three bands)**

| Inter-band DC Configuration | E-UTRA and NR Band | ΔRIB [dB] |
| --- | --- | --- |
| DC\_1-32\_n3 | 1 | 0 |
| 32 | 0 |
| n3 | 0 |

5.52.5 REFSENS requirements

The reference sensitivity exception (MSD) due to IMD3 for DC\_1-32\_n3 with UL DC\_1\_n3 is specified as below referring to the MSD for DC\_1A-11A\_n3A from 38.101-3.

Table 5.52.5-1: 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-32A\_n3A | n3 | 1720 | 5 | 25 | 1815 | N/A | N/A |
| 32 | N/A | 5 | 25 | 1480 | 15.2 | IMD34 |
| 1 | 1960 | 5 | 25 | 2150 | N/A | N/A |
| NOTE 4: This band is subject to IMD5 also which MSD is not specified. | | | | | | | |

## 5.53 DC\_3-32\_n1

5.53.1 Operating bands for DC

Table 5.53.1-1: Band combinations EN-DC (three bands)

| EN-DC band | E-UTRA CA band | NR band |
| --- | --- | --- |
| DC\_3-32\_n1 | CA\_3-32 | n1 |

5.53.2 Configuration for DC

Table 5.53.2-1: Inter-band EN-DC configurations (three bands)

| EN-DC  configuration | Uplink EN-DC  configuration  (NOTE 1) | E-UTRA CA configuration | NR band |
| --- | --- | --- | --- |
| DC\_3A-32A\_n1A | DC\_3A\_n1A | CA\_3-32 | n1 |

5.53.3 Co-existence studies

For UE coexistence study of Band 3 + Band n1, the 2nd, 3rd, 4th and 5th order harmonics and 2nd, 3rd, 4th and 5th order intermodulation products were calculated and presented in Table 5.53.3-1.

Table 5.53.3-1: Harmonic and IMD analysis

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **UE UL carriers** | **fx\_low** | **fx\_high** | **fy\_low** | **fy\_high** |
| UL frequency (MHz) | 1920 | 1980 | 1710 | 1785 |
| 2nd harmonics frequency limits | 2\*fx\_low | 2\*fx\_high | 2\* fy\_low | 2\* fy\_high |
| 2nd harmonics frequency limits (MHz) | 3840 | 3960 | 3420 | 3570 |
| 3rd harmonics frequency limits | 3\*fx\_low | 3\*fx\_high | 3\* fy\_low | 3\* fy\_high |
| 3rd harmonics frequency limits (MHz) | 5760 | 5940 | 5130 | 5355 |
| 4th harmonics frequency limits | 4\*fx\_low | 4\*fx\_high | 4\* fy\_low | 4\* fy\_high |
| 4th harmonics frequency limits (MHz) | 7680 | 7920 | 6840 | 7140 |
| 5th harmonics frequency limits | 5\*fx\_low | 5\*fx\_high | 5\* fy\_low | 5\* fy\_high |
| 5th harmonics frequency limits (MHz) | 9600 | 9900 | 8550 | 8925 |
| 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 | 135 | 3630 | 3765 |
| 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) | 2055 | 2250 | 1440 | 1650 |
| 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) | 5550 | 5745 | 5340 | 5550 |
| 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) | 3975 | 4230 | 3150 | 3435 |
| 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) | 7470 | 7725 | 7050 | 7335 |
| 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) | 270 | 540 | 7260 | 7530 |
| 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) | 5220 | 4860 | 6210 | 5895 |
| 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) | 1515 | 1170 | 2520 | 2190 |
| 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) | 8760 | 9120 | 9390 | 9705 |
| 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) | 8970 | 9315 | 9180 | 9510 |

IMD3 and IMD5 may fall into Rx of band 32 with UL DC\_3\_n1.

5.53.4 ∆TIB and ∆RIB values

Table 5.53.4-1: ΔTIB,c due to EN-DC(three bands)

| Inter-band DC Configuration | E-UTRA and NR Band | ΔTIB,c [dB] |
| --- | --- | --- |
| DC\_3-32\_n1 | 3 | 0.5 |
| n1 | 0.5 |

**Table 5.53.4-2: ΔRIB,c due to EN-DC (three bands)**

| Inter-band DC Configuration | E-UTRA and NR Band | ΔRIB [dB] |
| --- | --- | --- |
| DC\_3-32\_n1 | 3 | 0 |
| 32 | 0 |
| n1 | 0 |

5.53.5 REFSENS requirements

The reference sensitivity exception (MSD) due to IMD3 for DC\_3-32\_n1 with UL DC\_3\_n1 is specified as below referring to the MSD for DC\_1A-11A\_n3A from 38.101-3.

Table 5.53.5-1: 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-32A\_n1A | 3 | 1720 | 5 | 25 | 1815 | N/A | N/A |
| 32 | N/A | 5 | 25 | 1480 | 15.2 | IMD34 |
| n1 | 1960 | 5 | 25 | 2150 | N/A | N/A |
| NOTE 4: This band is subject to IMD5 also which MSD is not specified. | | | | | | | |

## 5.54 DC\_7-32\_n1

### 5.54.1 Configurations for DC

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

| DC  configuration | Uplink configuration |
| --- | --- |
| DC\_7A-32A\_n1A | DC\_7A\_n1A |

### 5.54.2 Co-existence studies

Table 5.54.2-1 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 5.54.2-1: 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 5.54.2-1,

- 2nd order harmonics may fall into Rx frequencies of band 77

- 3rd order harmonics may fall into Rx frequencies of bands 46 and 47

- 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 5.54.2-2 lists if up to 3rd order harmonics and IMD up to 5th order falls into one of these receiving bands.

Table 5.54.2-2: 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 | Yes | US/Europe | IMD3 |
| 2400 | - | 2494 | Yes | Asia | IMD3 |
| ISM band  (5GHz) | 5150 | - | 5925 | Yes | US | H3 n1, IMD4, IMD5 |
| 5150 | - | 5350 | Yes | Europe | IMD5 |
| 5470 | - | 5725 | Yes | IMD4 |
| 5150 | - | 5825 | Yes | Asia | IMD4, IMD5 |

The requirements for coexistence with protected bands exist for DC\_7A\_n1A in 38101-3.

### 5.54.3 ∆TIB and ∆RIB values

Table 5.54.3-1: ΔTIB,c

| Inter-band DC Configuration | E-UTRA and NR Band | ΔTIB,c [dB] |
| --- | --- | --- |
| DC\_7A-32A\_n1 | 7 | 0.6 |
| n1 | 0.5 |

**Table 5.54.3-2: ΔRIB**

| Inter-band DC Configuration | E-UTRA and NR Band | ΔRIB [dB] |
| --- | --- | --- |
| DC\_7A-32A\_n1 | 7 | 0 |
| 32 | 0 |
| n1 | 0 |

### 5.54.4 Reference sensitivity exceptions

**Table 5.54.4-1: 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-32A\_n1A | n1 | 1977.5 | 5 | 25 | 2167.5 | N/A | N/A |
| 7 | 2502.5 | 5 | 25 | 2622.5 | N/A | N/A |
| 32 | N/A | 5 | N/A | 1454.5 | 15.2 | IMD3 |

## 5.55 DC\_2-66\_n7

5.55.1 Configurations for DC

Table 5.55.1-1: Inter-band DC configurations (three bands)

| DC  configuration | Uplink  configuration |
| --- | --- |
| DC\_2A-66A\_n7A  DC\_2A-66A-66A\_n7A | DC\_2A\_n7A  DC\_66A\_n7A |

5.55.2 Co-existence studies

Co-existence studies on DC\_2\_n7 and DC\_66\_n7 show that there is no own Rx impact of the 3rd band from dual UL.

5.55.3 ∆TIB and ∆RIB values

For DC\_2-66\_n7, the ΔTIB,c and ΔRIB,c values are reused from the LTE combination CA\_2-7-66, and are given in the tables below.

Table 5.55.3-1: ΔTIB,c

| Inter-band DC Configuration | E-UTRA and NR Band | ΔTIB,c [dB] |
| --- | --- | --- |
| DC\_2-66-n7 | 2 | 0.5 |
| 66 | 0.5 |
| n7 | 0.5 |

**Table 5.55.3-2: ΔRIB**

| Inter-band DC Configuration | E-UTRA and NR Band | ΔRIB [dB] |
| --- | --- | --- |
| DC\_2-66-n7 | 2 | 0.3 |
| 66 | 0.5 |
| n7 | 0.5 |

5.55.4 REFSENS requirements

According to the co-existence studies, no additional MSD requirement is needed.

## 5.56 DC\_2-5\_n7

5.56.1 Configurations for DC

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

| DC  configuration | Uplink  configuration |
| --- | --- |
| DC\_2A-5A\_n7A | DC\_2A\_n7A  DC\_5A\_n7A |

5.56.2 Co-existence studies

Co-existence analysis from DC\_2\_n7 and DC\_7\_n5 show that there is no IMD impact from DC\_2\_n7 UL to band 5 DL or from DC\_5\_n7 UL to band 2 DL.

5.56.3 ∆TIB and ∆RIB values

For DC\_2-5\_n7, the ΔTIB,c and ΔRIB,c values are reused from the LTE combination CA\_2-5-7, and are given in the tables below.

Table 5.56.3-1: ΔTIB,c

| Inter-band DC Configuration | E-UTRA and NR Band | ΔTIB,c [dB] |
| --- | --- | --- |
| DC\_2-5-n7 | 2 | 0.5 |
| 5 | 0.3 |
| n7 | 0.5 |

**Table 5.56.3-2: ΔRIB**

| Inter-band DC Configuration | E-UTRA and NR Band | ΔRIB [dB] |
| --- | --- | --- |
| DC\_2-5-n7 | 2 | 0 |
| 5 | 0 |
| n7 | 0 |

5.56.4 REFSENS requirements

According to the co-existence studies, no additional MSD requirement is needed.

## 5.57 DC\_2-8\_n2

5.57.1 Configurations for DC

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

| DC  configuration | Uplink  configuration |
| --- | --- |
| DC\_2A-8A\_n2A | DC\_2A\_n2A1  DC\_8A\_n2A |
| NOTE1: Only single switched UL is supported | |

5.57.2 Co-existence studies

Co-existence analysis from DC\_8\_n2 show that IMD4 of the dual UL of DC\_8\_n2 may fall into the DL of band 2.

5.57.3 ∆TIB and ∆RIB values

For DC\_2-8\_n2, the ΔTIB,c and ΔRIB,c values are reused from the DC\_8\_n2, and are given in the tables below.

Table 5.57.3-1: ΔTIB,c

| Inter-band DC Configuration | E-UTRA and NR Band | ΔTIB,c [dB] |
| --- | --- | --- |
| DC\_2-8-n2 | 2 | 0.3 |
| 8 | 0.3 |
| n2 | 0.3 |

**Table 5.57.3-2: ΔRIB**

| Inter-band DC Configuration | E-UTRA and NR Band | ΔRIB [dB] |
| --- | --- | --- |
| DC\_2-8-n2 | 2 | 0 |
| 8 | 0 |
| n2 | 0 |

5.57.4 REFSENS requirements

Based on the co-existence studies MSD due to IMD4 is required. The MSD values can be reused from DC\_8-n2.

Table 6.1.x.6-1: Reference sensitivity exceptions for PCell due to dual uplink operation for EN-DC in NR FR1 (two bands)

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| NR or E-UTRA Band / Channel bandwidth / NRB / MSD | | | | | | | | |
| EN-DC  Configuration | EUTRA or NR band | UL Fc  (MHz) | UL/DL BW  (MHz) | UL  LCRB | DL Fc (MHz) | MSD  (dB) | Duplex mode | IMD order |
| DC\_2-8\_n2 | 2 | 1860 | 5 | 25 | 1940 | 4 | FDD | IMD4 |
| 8 | 910 | 5 | 25 | 955 | N/A | N/A |
| n2 | 1880 | 5 | 25 | 1960 | N/A | N/A |

## 5.58 DC\_5-66\_n7

5.58.1 Configurations for DC

Table 5.58.1-1: Inter-band DC configurations (three bands)

| DC  configuration | Uplink  configuration |
| --- | --- |
| DC\_5A-66A\_n7A  DC\_5A-66A-66A\_n7A | DC\_5A\_n7A  DC\_66A\_n7A |

5.58.2 Co-existence studies

Co-existence studies from lower order DCs show that the IMD3 of the dual UL of DC\_66\_n7 may fall into the DL of band 5 while there is no own Rx impact of the 3rd band from dual UL of DC\_7\_n5.

5.58.3 ∆TIB and ∆RIB values

For DC\_5-66\_n7, the ΔTIB,c and ΔRIB,c values are reused from the LTE combination CA\_5-7-66, and are given in the tables below.

Table 5.58.3-1: ΔTIB,c

| Inter-band DC Configuration | E-UTRA and NR Band | ΔTIB,c [dB] |
| --- | --- | --- |
| DC\_5-66-n7 | 5 | 0.3 |
| 66 | 0.5 |
| n7 | 0.5 |

**Table 5.58.3-2: ΔRIB**

| Inter-band DC Configuration | E-UTRA and NR Band | ΔRIB [dB] |
| --- | --- | --- |
| DC\_5-66-n7 | 5 | 0 |
| 66 | 0.5 |
| n7 | 0.5 |

5.58.4 REFSENS requirements

The MSD values for own Rx impact of the 3rd band stated in 5.58.2 are shown in the following table.

Table 5.58.4-1: 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\_5A-66A\_n7A  DC\_5A-66A-66A\_n7A | 5 | 835 | 5 | 25 | 880 | 18.0 | FDD | IMD3 |
| 66 | 1720 | 5 | 25 | 2120 | N/A | FDD | N/A |
| n7 | 2560 | 5 | 25 | 2680 | N/A | FDD | N/A |

## 5.59 DC\_20-32\_n1

5.59.1 Configurations for DC

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

| DC  configuration | Uplink  configuration |
| --- | --- |
| DC\_20A-32A\_n1A | DC\_20A\_n1A |

5.59.2 Co-existence studies

Co-existence analysis from DC\_20\_n1 shows that IMD5 of the dual UL may fall into the DL of band 32.

5.59.3 ∆TIB and ∆RIB values

For DC\_20-32\_n1, the ΔTIB,c and ΔRIB,c values are reused from the LTE combination CA\_1-20-32, and are given in the tables below.

Table 5.59.3-1: ΔTIB,c

| Inter-band DC Configuration | E-UTRA and NR Band | ΔTIB,c [dB] |
| --- | --- | --- |
| DC\_20-32-n1 | 20 | 0.3 |
| n1 | 0.5 |

**Table 5.59.3-2: ΔRIB**

| Inter-band DC Configuration | E-UTRA and NR Band | ΔRIB [dB] |
| --- | --- | --- |
| DC\_20-32-n1 | 20 | 0 |
| 32 | 0 |
| n1 | 0 |

5.59.4 REFSENS requirements

**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\_20A-32A\_n1A | n1 | 1950.5 | 5 | 50 | 2140.5 | N/A | N/A |
| 20 | 852.5 | 5 | 25 | 811.5 | N/A | N/A |
| 32 | N/A | 5 | N/A | 1459.5 | 4.0 | IMD5 |

## 5.60 DC\_20-32\_n3

5.60.1 Configurations for DC

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

| DC  configuration | Uplink  configuration |
| --- | --- |
| DC\_20A-32A\_n3A | DC\_20A\_n3A |

5.60.2 Co-existence studies

Co-existence analysis from DC\_20\_n3 shows that no IMD impact on the DL of band 32 from the dual UL.

5.60.3 ∆TIB and ∆RIB values

For DC\_20-32\_n3, the ΔTIB,c and ΔRIB,c values are reused from the LTE combination CA\_3-20-32, and are given in the tables below.

Table 5.60.3-1: ΔTIB,c

| Inter-band DC Configuration | E-UTRA and NR Band | ΔTIB,c [dB] |
| --- | --- | --- |
| DC\_20-32-n3 | 20 | 0.3 |
| n3 | 0.5 |

**Table 5.60.3-2: ΔRIB**

| Inter-band DC Configuration | E-UTRA and NR Band | ΔRIB [dB] |
| --- | --- | --- |
| DC\_20-32-n3 | 20 | 0 |
| 32 | 0 |
| n3 | 0 |

5.60.4 REFSENS requirements

No additional MSD requirement is needed.

## 5.61 DC\_1-3\_n3

### 5.61.1 Configuration for DC

**Table 5.61.1-1: Inter-band EN-DC configurations (three bands)**

| DC configuration | Uplink configuration  (NOTE 1) |
| --- | --- |
| DC\_1A-3A\_n3A | DC\_1A\_n3A  DC\_3A\_n3A2 |
| NOTE 2: Only single switched UL is supported | |

5.61.2 Co-existence study

Co-existence studies of this 3DL/2UL DC configuration are already covered in the constituent fall-back modes. And there is no IMD issue for this DC configuration.

### 5.61.3 ∆TIB and ∆RIB values

For DC\_1-3\_n3, the ΔTIB,c and ΔRIB,c values are given in the tables below. Numbers come from DC\_1\_n3.

Table 5.1.x.3-1: ΔTIB,c

| Inter-band DC Configuration | E-UTRA and NR Band | ΔTIB,c [dB] |
| --- | --- | --- |
| DC\_1-3\_n3 | 1 | 0.3 |
| 3 | 0.3 |
| n3 | 0.3 |

Table 5.1.x.3-2: ΔRIB,c

| Inter-band DC Configuration | E-UTRA and NR Band | ΔRIB,c [dB] |
| --- | --- | --- |
| DC\_1-3\_n3 | 1 | 0 |
| 3 | 0 |
| n3 | 0 |

### 5.61.4 REFSENS requirements

No additional MSD requirements need to be defined.

## 5.62 DC\_1-41\_n3

### 5.62.1 Configuration for DC

**Table 5.62.1-1: Inter-band EN-DC configurations (three bands)**

| DC configuration | Uplink configuration  (NOTE 1) |
| --- | --- |
| DC\_1A-41A\_n3A  DC\_1A-41C\_n3A | DC\_1A\_n3A |

5.62.2 Co-existence study

Co-existence studies of this 3DL/2UL DC configuration are already covered in the constituent fall-back modes. And it can be get:

- IMD5 of band 1 UL and band n3 UL falling to band 41 DL.

The MSD could reuse the value for CA\_1A-3A-41A.

### 5.62.3 ∆TIB and ∆RIB values

For DC\_1-41\_n3, the ΔTIB,c and ΔRIB,c values have been defined in TS 38.101-3..

### 5.62.4 REFSENS requirements

Table 5.62.4-1 shows the required MSD levels for the DC configuration, its value can reuse the value for CA\_1A-3A-41A.

Table 5.62.4-1: 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** | | | | | | | |
| **DC**  **Configuration** | **EUTRA and NR band** | **UL Fc  (MHz)** | **UL/DL BW  (MHz)** | **UL  CLRB** | **DL Fc (MHz)** | **MSD  (dB)** | **IMD order** |
| DC\_1A-41A\_n3A  DC\_1A-41C\_n3A | 1 | 1977.5 | 5 | 25 | 2167.5 | N/A | N/A |
| 41 | 2507.5 | 5 | 25 | 2507.5 | 5.0 | IMD5  |3\*fB1-2\*fn3| |
| n3 | 1712.5 | 5 | 25 | 1807.5 | N/A | N/A |

## 5.63 DC\_3-18\_n3

### 5.63.1 Configuration for DC

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

| DC configuration | Uplink configuration  (NOTE 1) |
| --- | --- |
| DC\_3A-18A\_n3A | DC\_3A\_n3A2  DC\_18A\_n3A |
| NOTE 2: Only single switched UL is supported | |

5.63.2 Co-existence study

Co-existence studies of this 3DL/2UL DC configuration are already covered in the constituent fall-back modes. And it can be get:

- IMD4 of band 18 UL and band n3 UL falling to band 3 DL.

The MSD could reuse the value for DC\_18A\_n3A.

### 5.63.3 ∆TIB and ∆RIB values

For DC\_3-18\_n3, the ΔTIB,c and ΔRIB,c values are given in the tables below. Numbers come from DC\_18\_n3.

Table 5.1.x.3-1: ΔTIB,c

| Inter-band DC Configuration | E-UTRA and NR Band | ΔTIB,c [dB] |
| --- | --- | --- |
| DC\_3-18\_n3 | 3 | 0.3 |
| 18 | 0.3 |
| n3 | 0.3 |

Table 5.1.x.3-2: ΔRIB,c

| Inter-band DC Configuration | E-UTRA and NR Band | ΔRIB [dB] |
| --- | --- | --- |
| DC\_3-18\_n3 | 3 | 0 |
| 18 | 0 |
| n3 | 0 |

### 5.63.4 REFSENS requirements

Table 5.63.4-1 shows the required MSD levels for the DC configuration, its value can reuse the value for DC 18A\_n3A.

Table 5.63.4-1: 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** | | | | | | | |
| **DC**  **Configuration** | **EUTRA and NR band** | **UL Fc  (MHz)** | **UL/DL BW  (MHz)** | **UL  CLRB** | **DL Fc (MHz)** | **MSD  (dB)** | **IMD order** |
| DC\_3A-18A\_n3A | 3 | 1719 | 5 | 25 | 1814 | 4 | IMD4  |2\*fn3-2\*fB18| |
| 18 | 823 | 5 | 25 | 868 | N/A | N/A |
| n3 | 1730 | 5 | 25 | 1825 | N/A | N/A |

## 5.64 DC\_3-41\_n3

### 5.64.1 Configuration for DC

**Table 5.64.1-1: Inter-band EN-DC configurations (three bands)**

| DC configuration | Uplink configuration  (NOTE 1) |
| --- | --- |
| DC\_3A-41A\_n3A  DC\_3A-41C\_n3A | DC\_3A\_n3A2  DC\_41A\_n3A  DC\_41C\_n3A |
| NOTE 2: Only single switched UL is supported | |

5.64.2 Co-existence study

Co-existence studies of this 3DL/2UL DC configuration are already covered in the constituent fall-back modes. And it can be get:

- IMD4 of band 41 UL and band n3 UL falling to band 3 DL.

The MSD could reuse the value for DC\_41A\_n3A.

### 5.64.3 ∆TIB and ∆RIB values

For DC\_3-41\_n3, the ΔTIB,c and ΔRIB,c values are given in the tables below. Numbers come from DC\_41\_n3.

Table 5.1.x.3-1: ΔTIB,c

| Inter-band DC Configuration | E-UTRA and NR Band | ΔTIB,c [dB] |
| --- | --- | --- |
| DC\_3-41\_n3 | 3 | 0.5 |
| 41 | 0.31/0.82 |
| n3 | 0.5 |
| NOTE 1: Applicable for the frequency range of 2515-2690 MHz.  NOTE 2: Applicable for the frequency range of 2496-2515 MHz. | | |

Table 5.1.x.3-2: ΔRIB,c

| Inter-band DC Configuration | E-UTRA and NR Band | ΔRIB,c [dB] |
| --- | --- | --- |
| DC\_3-41\_n3 | 3 | 0 |
| 41 | 01/0.52 |
| n3 | 0 |
| NOTE 1: Applicable for the frequency range of 2515-2690 MHz.  NOTE 2: Applicable for the frequency range of 2496-2515 MHz. | | |

### 5.64.4 REFSENS requirements

Table 5.64.4-1 shows the required MSD levels for the DC configuration, its value can reuse the value of DC\_3A\_n41A.

Table 5.64.4-1: 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** | | | | | | | |
| **DC**  **Configuration** | **EUTRA and NR band** | **UL Fc  (MHz)** | **UL/DL BW  (MHz)** | **UL  CLRB** | **DL Fc (MHz)** | **MSD  (dB)** | **IMD order** |
| DC\_3A-41A\_n3A  DC\_3A-41C\_n3A | 3 | 1770 | 5 | 25 | 1865 | 8.2 | IMD4  |2\*fB41-2\*fn3| |
| 41 | 2657.5 | 5 | 25 | 2657.5 | N/A | N/A |
| n3 | 1725 | 5 | 25 | 1820 | N/A | N/A |

## 5.65 Void















## 5.66 DC\_7-66\_n77 and DC\_7-7-66\_n77

### 5.66.1 Configuration for DC

**Table 5.66.1-1: Inter-band EN-DC configurations (three bands)**

| DC configuration | Uplink configuration  (NOTE 1) |
| --- | --- |
| DC\_7A-66A\_n77A  DC\_7A-7A-66A\_n77A  DC\_7A-7A-66A\_n77(2A)  DC\_7A-66A\_n77(2A)  DC\_7C-66A\_n77A  DC\_7C-66A\_n77(2A) | DC\_7A\_n77A  DC\_66A\_n77A |

5.66.2 Co-existence study

Co-existence studies of this 3DL/2UL DC configuration are already covered in the constituent fall-back modes. And it can be get:

- IMD4 of band 7 UL and band n77 UL falling to band 66 DL.

- IMD5 of band 66 UL and band n77 UL falling to band 7 DL.

The MSD could reuse the value for CA\_3A-7A-26A.

### 5.66.3 ∆TIB and ∆RIB values

For DC\_7-66\_n77 and DC\_7-7-66\_n77, the ΔTIB,c and ΔRIB,c values are given in the tables below. Numbers come from LTE CA\_5A-7A-66A.

Table 5.66.3-1: ΔTIB,c

| Inter-band DC Configuration | E-UTRA and NR Band | ΔTIB,c [dB] |
| --- | --- | --- |
| DC\_7-66\_n77  DC\_7-7-66\_n77 | 7 | 0.5 |
| 66 | 0.6 |
| n77 | 0.8 |

Table 5.66.3-2: ΔRIB,c

| Inter-band DC Configuration | E-UTRA and NR Band | ΔRIB [dB] |
| --- | --- | --- |
| DC\_7-66\_n77  DC\_7-7-66\_n77 | 7 | 0.5 |
| 66 | 0.5 |
| n77 | 0.5 |

### 5.66.4 REFSENS requirements

Table 5.66.4-1 shows the required MSD levels for the DC configuration.

The MSD levels are derived from the text proposal in R4-2014129 and R4-2015711

Table 5.66.4-1: Reference sensitivity exceptions for Scell due to dual uplink operation for EN-DC in NR FR1 (three bands)



| **NR or E-UTRA Band / Channel bandwidth / NRB / MSD** | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **EN-DC Configuration** | **EUTRA / NR band** | **UL Fc  (MHz)** | **UL/DL BW  (MHz)** | **UL**  **LCRB** | **DL Fc (MHz)** | **MSD  (dB)** | **IMD order** |
| DC\_7A-66A\_n77A  DC\_7C-66A\_n77A  DC\_7A-7A-66A\_n77A  DC\_7A-66A\_n77(2A)  DC\_7C-66A\_n77(2A)  DC\_7A-7A-66A\_n77(2A) | 7 | 2550 | 5 | 25 | 2685 | N/A | N/A |
| 66 | 1750 | 5 | 25 | 2150 | 8.7 | IMD4 |
| n77 | 3625 | 10 | 50 | 3475 | N/A | N/A |
| 66 | 1715 | 5 | 25 | 2115 | N/A | N/A |
| 7 | 2550 | 5 | 25 | 2670 | 5.2 | IMD5 |
| n77 | 4190 | 10 | 50 | 4190 | N/A | N/A |
| 66 | 1720 | 5 | 25 | 2120 | N/A | N/A |
| 7 | 2520 | 5 | 25 | 2640 | 3.4 | IMD5 |
| n77 | 3900 | 10 | 50 | 3900 | N/A | N/A |

## 5.67 DC\_2-5\_n48

### 5.67.1 Configuration for DC

**Table 5.67.1-1: Inter-band EN-DC configurations (three bands)**

| DC configuration | Uplink configuration  (NOTE 1) |
| --- | --- |
| DC\_2A-5A\_n48A  DC\_2A-5A\_n48B | DC\_2A\_n48A  DC\_5A\_n48A |

5.67.2 Co-existence study

Co-existence studies of this 3DL/2UL DC configuration are already covered in the constituent fallback modes. It can be got:

- The IMD3 of UL configuration on DC\_5\_n48 will impact of the Band 2 DL.

### 5.67.3 ∆TIB and ∆RIB values

For DC\_2-5\_n48, the ΔTIB,c and ΔRIB,c values are given in the tables below that reused the values for CA\_2-5-48.

Table 5.67.3-1: ΔTIB,c

| Inter-band DC Configuration | E-UTRA and NR Band | ΔTIB,c [dB] |
| --- | --- | --- |
| DC\_2-5\_n48 | 2 | 0.6 |
| 5 | 0.3 |
| n48 | 0.8 |

Table 5.67.3-2: ΔRIB,c

| Inter-band DC Configuration | E-UTRA and NR Band | ΔRIB [dB] |
| --- | --- | --- |
| DC\_2-5\_n48 | 2 | 0.2 |
| 5 | 0 |
| n48 | 0.5 |

### 5.67.4 REFSENS requirements

Table 5.67.4-1 shows the required MSD levels for the DC configuration.

Table 5.67.4-1: 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** | | | | | | | |
| **DC**  **Configuration** | **EUTRA and NR band** | **UL Fc  (MHz)** | **UL/DL BW  (MHz)** | **UL  CLRB** | **DL Fc (MHz)** | **MSD  (dB)** | **IMD order** |
| DC\_2A-5A\_n48A  DC\_2A-5A\_n48B | 2 | 1882 | 5 | 25 | 1962 | 15.6 | IMD3  | fn48-2\*fB5| |
| 5 | 839 | 5 | 25 | 884 | N/A | N/A |
| n48 | 3640 | 5 | 25 | 3640 | N/A | N/A |

## 5.68 DC\_2-13\_n48

### 5.68.1 Configuration for DC

**Table 5.68.1-1: Inter-band EN-DC configurations (three bands)**

| DC configuration | Uplink configuration  (NOTE 1) |
| --- | --- |
| DC\_2A-13A\_n48A  DC\_2A-13A\_n48B | DC\_2A\_n48A  DC\_13A\_n48A |

5.68.2 Co-existence study

Co-existence studies of this 3DL/2UL DC configuration are already covered in the constituent fallback modes. It can be got:

- The IMD3 of UL configuration on DC\_13\_n48 will impact of the Band 2 DL.

### 5.68.3 ∆TIB and ∆RIB values

For DC\_2-13\_n48, the ΔTIB,c and ΔRIB,c values are given in the tables below that reused the values for CA\_2-13-48.

Table 5.68.3-1: ΔTIB,c

| Inter-band DC Configuration | E-UTRA and NR Band | ΔTIB,c [dB] |
| --- | --- | --- |
| DC\_2-13\_n48 | 2 | 0.6 |
| 13 | 0.3 |
| n48 | 0.8 |

Table 5.68.3-2: ΔRIB,c

| Inter-band DC Configuration | E-UTRA and NR Band | ΔRIB [dB] |
| --- | --- | --- |
| DC\_2-13\_n48 | 2 | 0.2 |
| 13 | 0 |
| n48 | 0.5 |

### 5.68.4 REFSENS requirements

Table 5.68.4-1 shows the required MSD levels for the DC configuration.

Table 5.68.4-1: 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** | | | | | | | |
| **DC**  **Configuration** | **EUTRA and NR band** | **UL Fc  (MHz)** | **UL/DL BW  (MHz)** | **UL  CLRB** | **DL Fc (MHz)** | **MSD  (dB)** | **IMD order** |
| DC\_2A-13A\_n48A  DC\_2A-13A\_n48B | 2 | 1903.5 | 5 | 25 | 1983.5 | 15.6 | IMD3  | fn48-2\*fB13| |
| 13 | 784.5 | 5 | 25 | 753.5 | N/A | N/A |
| n48 | 3552.5 | 5 | 25 | 3552.5 | N/A | N/A |

## 5.69 Void















## 5.70 DC\_5-46\_n66

### 5.70.1 Configuration for DC

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

| DC configuration | Uplink configuration  (NOTE 1) |
| --- | --- |
| DC\_5A-46A\_n66A | DC\_5A\_n66A  DC\_46A\_n66A |

5.70.2 Co-existence study

Co-existence studies of this 3DL/2UL DC configuration are already covered in the constituent fallback modes. It can be got:

- The IMD4 and IMD5 of UL configuration on DC\_5\_n66 will impact of the Band 46 DL

### 5.70.3 ∆TIB and ∆RIB values

For DC\_5-46\_n66, the ΔTIB,c and ΔRIB,c values are given in the tables below that reused the values for DC\_46-66\_n5.

Table 5.1.x.3-1: ΔTIB,c

| Inter-band DC Configuration | E-UTRA and NR Band | ΔTIB,c [dB] |
| --- | --- | --- |
| DC\_5-46\_n66 | 5 | 0.3 |
| 46 | 0 |
| n66 | 0.3 |

Table 5.1.x.3-2: ΔRIB,c

| Inter-band DC Configuration | E-UTRA and NR Band | ΔRIB [dB] |
| --- | --- | --- |
| DC\_5-46\_n66 | 5 | 0 |
| 46 | 0 |
| n66 | 0 |

### 5.70.4 REFSENS requirements

Table 5.70.4-1 shows the required MSD levels for the DC configuration.

Table 5.70.4-1: 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** | | | | | | | |
| **DC**  **Configuration** | **EUTRA and NR band** | **UL Fc  (MHz)** | **UL/DL BW  (MHz)** | **UL  CLRB** | **DL Fc (MHz)** | **MSD  (dB)** | **IMD order** |
| DC\_5A-46A\_n66A | 5 | 847 | 5 | 25 | 892 | N/A | N/A |
| 46 | 5163 | 10 | 50 | 5163 | 9.01 | IMD4  |2\*fB5+2\*fn66| |
| n66 | 1775 | 5 | 25 | 2175 | N/A | N/A |
| NOTE 1: This band is subject to IMD5 also which MSD is not specified | | | | | | | |

## 5.71 DC\_5-66\_n48 and DC\_5-66-66\_n48

### 5.71.1 Configuration for DC

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

| DC configuration | Uplink configuration  (NOTE 1) |
| --- | --- |
| DC\_5A-66A\_n48A  DC\_5A-66A\_n48B  DC\_5A-66A-66A\_n48A  DC\_5A-66A-66A\_n48B | DC\_5A\_n48A  DC\_66A\_n48A |

5.71.2 Co-existence study

Co-existence studies of this 3DL/2UL DC configuration are already covered in the constituent fallback modes. There is no IMD impact to their own third band RX.

### 5.71.3 ∆TIB and ∆RIB values

For DC\_5-66\_n48, the ΔTIB,c and ΔRIB,c values are given in the tables below that reused the values for CA\_5-66-48.

Table 5.1.x.3-1: ΔTIB,c

| Inter-band DC Configuration | E-UTRA and NR Band | ΔTIB,c [dB] |
| --- | --- | --- |
| DC\_5-66\_n48  DC\_5-66-66\_n48 | 5 | 0.3 |
| 66 | 0.6 |
| n48 | 0.8 |

Table 5.1.x.3-2: ΔRIB,c

| Inter-band DC Configuration | E-UTRA and NR Band | ΔRIB [dB] |
| --- | --- | --- |
| DC\_5-66\_n48  DC\_5-66-66\_n48 | 5 | 0 |
| 66 | 0.2 |
| n48 | 0.5 |

### 5.71.4 REFSENS requirements

There is no additional MSD requirement for this band combination.

## 5.72 DC\_5-66\_n77

### 5.72.1 Configuration for DC

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

| DC configuration | Uplink configuration  (NOTE 1) |
| --- | --- |
| DC\_5A-66A\_n77A | DC\_5A\_n77A  DC\_66A\_n77A |

5.72.2 Co-existence study

Co-existence studies of this 3DL/2UL DC configuration are already covered in the constituent fallback modes. It can be got:

- The IMD3 of UL DC\_5A\_n77A may impact to band 66 Rx.

### 5.72.3 ∆TIB and ∆RIB values

For DC\_5-66\_n77, the ΔTIB,c and ΔRIB,c values are given in the tables below that reused the values for CA\_5-66\_n78.

Table 5.72.3-1: ΔTIB,c

| Inter-band DC Configuration | E-UTRA and NR Band | ΔTIB,c [dB] |
| --- | --- | --- |
| DC\_5-66\_n77 | 5 | 0.6 |
| 66 | 0.6 |
| n77 | 0.8 |

Table 5.72.3-2: ΔRIB,c

| Inter-band DC Configuration | E-UTRA and NR Band | ΔRIB [dB] |
| --- | --- | --- |
| DC\_5-66\_n77 | 5 | 0.2 |
| 66 | 0.2 |
| n77 | 0.5 |

### 5.72.4 REFSENS requirements

Table 5.72.4-1 shows the required MSD levels for the DC configuration.

Table 5.72.4-1: 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** | | | | | | | |
| **DC**  **Configuration** | **EUTRA and NR band** | **UL Fc  (MHz)** | **UL/DL BW  (MHz)** | **UL  CLRB** | **DL Fc (MHz)** | **MSD  (dB)** | **IMD order** |
| DC\_5A-66A\_n77A | 5 | 826.5 | 5 | 25 | 871.5 | N/A | N/A |
| 66 | 1742 | 5 | 25 | 2142 | 13.2 | IMD3  |fn77-2\*fB5| |
| n77 | 3795 | 10 | 50 | 3795 | N/A | N/A |

## 5.73 DC\_1-42\_n3

5.73.1 Configurations for DC\_1-42\_n3

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

| DC  configuration | Uplink configuration |
| --- | --- |
| DC\_1A-42A\_n3A | DC\_1A\_n3A  DC\_42A\_n3A |
| DC\_1A-42C\_n3A | DC\_1A\_n3A  DC\_42A\_n3A  DC\_42C\_n3A |

5.73.2 Co-existence studies

When Uplink EN-DC configuration is DC\_1A\_n3A, IMD4 of (B1 - n3) will fall into Rx band of Band 42.

5.73.3 ∆TIB and ∆RIB values

The following relaxation values are proposed:

Table 5.73.3-1: ΔTIB,c

| Inter-band EN-DC configuration | E-UTRA or NR Band | ΔTIB,c (dB) |
| --- | --- | --- |
| DC\_1-42\_n3 | 1 | 0.3 |
| 42 | 0.8 |
| n3 | 0.6 |

Table 5.73.3-2: ΔRIB

|  |  |  |
| --- | --- | --- |
| Inter-band EN-DC configuration | NR Band | ΔRIB,c (dB) |
| DC\_1-42\_n3 | 1 | 0 |
| 42 | 0.5 |
| n3 | 0.2 |

5.73.4 Reference sensitivity exceptions

As mentioned above, IMD4 of B1 and n3 to Band42 Rx needs to be addressed for REFSENS relaxation. The following values are proposed:

Table 5.73.4-1: Reference sensitivity exceptions 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)** | **Duplex mode** | **IMD order** |
| DC\_1A-42A\_n3A | 1 | 1922.5 | 5 | 25 | 2112.5 | N/A | FDD | N/A |
| n3 | 1782.5 | 5 | 25 | 1877.5 | N/A | FDD | N/A |
| 42 | 3425 | 5 | 25 | 3425 | 13.0 | TDD | IMD4 |

## 5.74 DC\_8-42\_n3

5.74.1 Configurations for DC\_8-42\_n3

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

| DC  configuration | Uplink configuration |
| --- | --- |
| DC\_8A-42A\_n3A | DC\_8A\_n3A  DC\_42A\_n3A |
| DC\_8A-42C\_n3A | DC\_8A\_n3A  DC\_42A\_n3A  DC\_42C\_n3A |

5.74.2 Co-existence studies

When Uplink EN-DC configuration is DC\_8A\_n3A, IMD3 and IMD5 of (B8 - n3) will fall into Rx band of Band 42.

5.74.3 ∆TIB and ∆RIB values

The following relaxation values are proposed:

Table 5.74.3-1: ΔTIB,c

| Inter-band EN-DC configuration | E-UTRA or NR Band | ΔTIB,c (dB) |
| --- | --- | --- |
| DC\_8-42\_n3 | 8 | 0.6 |
| 42 | 0.8 |
| n3 | 0.6 |

Table 5.74.3-2: ΔRIB

|  |  |  |
| --- | --- | --- |
| Inter-band EN-DC configuration | NR Band | ΔRIB,c (dB) |
| DC\_8-42\_n3 | 8 | 0.2 |
| 42 | 0.5 |
| n3 | 0.2 |

5.74.4 Reference sensitivity exceptions

As mentioned above, IMD3 of B8 and n3 to Band42 Rx needs to be addressed for REFSENS relaxation. The following values are proposed:

Table 5.74.4-1: Reference sensitivity exceptions 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)** | **Duplex mode** | **IMD order** |
| DC\_8A-42A\_n3A | 8 | 900 | 5 | 25 | 945 | N/A | FDD | N/A |
| n3 | 1740 | 5 | 25 | 1835 | N/A | FDD | N/A |
| 42 | 3540 | 5 | 25 | 3540 | 16.3 | TDD | IMD3 |

## 5.75 DC\_3-18\_n28

### 5.75.1 Configurations for DC

Table 5.75.1-1: Inter-band DC configurations (three bands)

| DC  configuration | Uplink configuration |
| --- | --- |
| DC\_3A-18A\_n28A | DC\_3A\_n28A  DC\_18A\_n28A |

### 5.75.2 Co-existence studies

Based on co-existence studies of DC\_3\_n28 and DC\_18\_n28, there is no the 3rd band issue.

### 5.75.3 ∆TIB and ∆RIB values

For DC\_3-18\_n28, the ΔTIB,c and ΔRIB,c values are given in the tables below.

Table 5.75.3-1: ΔTIB,c

| Inter-band DC Configuration | E-UTRA and NR Band | ΔTIB,c [dB] |
| --- | --- | --- |
| DC\_3-18\_n28 | 3 | 0.3 |
| 18 | 0.5 |
| n28 | 0.3 |

**Table 5.75.3-2: ΔRIB**

| Inter-band DC Configuration | E-UTRA and NR Band | ΔRIB [dB] |
| --- | --- | --- |
| DC\_3-18\_n28 | 3 | 0 |
| 18 | 0 |
| n28 | 0 |

### 5.75.4 Reference sensitivity exceptions

There is no additional MSD requirement for this configuration.

## 5.76 DC\_2-66\_n77

5.76.1 Operating bands for DC

Table 5.76.1-1: Inter-band DC configurations (three bands)

| DC configuration | Uplink configuration |
| --- | --- |
| DC\_2A-66A\_n77A | DC\_2A\_n77A DC\_66A\_n77A |

5.76.2 Co-existence studies

For UE coexistence study of Band 2 + Band n77, the 2nd, 3rd, 4th and 5th order harmonics and 2nd, 3rd, 4th and 5th order intermodulation products were calculated and presented in Table 5.76.2-1.

Table 5.76.2-1: Harmonic and IMD analysis

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **UE UL carriers** | **fx\_low** | **fx\_high** | **fy\_low** | **fy\_high** |
| UL frequency (MHz) | 1850 | 1910 | 3300 | 4200 |
| 2nd harmonics frequency limits | 2\*fx\_low | 2\*fx\_high | 2\* fy\_low | 2\* fy\_high |
| 2nd harmonics frequency limits (MHz) | 3700 | 3820 | 6600 | 8400 |
| 3rd harmonics frequency limits | 3\*fx\_low | 3\*fx\_high | 3\* fy\_low | 3\* fy\_high |
| 3rd harmonics frequency limits (MHz) | 5550 | 5730 | 9900 | 12600 |
| 4th harmonics frequency limits | 4\*fx\_low | 4\*fx\_high | 4\*fy\_low | 4\*fy\_high |
| 4th harmonics frequency limits (MHz) | 7400 | 7640 | 13200 | 16800 |
| 5th harmonics frequency limits | 5\*fx\_low | 5\*fx\_high | 5\* fy\_low | 5\* fy\_high |
| 5th harmonics frequency limits (MHz) | 9250 | 9550 | 16500 | 21000 |
| Two tone 2nd order IMD products | fy\_low – fx\_high | fy\_high – fx\_low | fx\_low + fy\_low | fx\_high + fy\_high |
| IMD frequency limits (MHz) | 1390 | 2350 | 5150 | 6110 |
| 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) | -500 | 520 | 4690 | 6550 |
| 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) | 7000 | 8020 | 8450 | 10310 |
| 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) | 1350 | 2430 | 7990 | 10750 |
| 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) | 8850 | 9930 | 11750 | 14510 |
| 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) | -4700 | -2780 | 10300 | 12220 |
| 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) | -14950 | -11290 | -4340 | -3200 |
| 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 | 18710 | 10700 | 11840 |
| 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) | -8900 | -6080 | 870 | 2850 |
| 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 | 16420 | 12150 | 14130 |

For UE coexistence study of Band 66 + Band n77, the 2nd, 3rd, 4th and 5th order harmonics and 2nd, 3rd, 4th and 5th order intermodulation products were calculated and presented in Table 5.76.2-2.

Table 5.76.2-2: Harmonic and IMD analysis

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **UE UL carriers** | **fx\_low** | **fx\_high** | **fy\_low** | **fy\_high** |
| UL frequency (MHz) | 1710 | 1780 | 3300 | 4200 |
| 2nd harmonics frequency limits | 2\*fx\_low | 2\*fx\_high | 2\* fy\_low | 2\* fy\_high |
| 2nd harmonics frequency limits (MHz) | 3420 | 3560 | 6600 | 8400 |
| 3rd harmonics frequency limits | 3\*fx\_low | 3\*fx\_high | 3\* fy\_low | 3\* fy\_high |
| 3rd harmonics frequency limits (MHz) | 5130 | 5340 | 9900 | 12600 |
| 4th harmonics frequency limits | 4\*fx\_low | 4\*fx\_high | 4\*fy\_low | 4\*fy\_high |
| 4th harmonics frequency limits (MHz) | 6840 | 7120 | 13200 | 16800 |
| 5th harmonics frequency limits | 5\*fx\_low | 5\*fx\_high | 5\* fy\_low | 5\* fy\_high |
| 5th harmonics frequency limits (MHz) | 8550 | 8900 | 16500 | 21000 |
| Two tone 2nd order IMD products | fy\_low – fx\_high | fy\_high – fx\_low | fx\_low + fy\_low | fx\_high + fy\_high |
| IMD frequency limits (MHz) | 1520 | 2490 | 5010 | 5980 |
| 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) | 780 | 260 | 4820 | 6690 |
| 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) | 6720 | 7760 | 8310 | 10180 |
| 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) | 930 | 2040 | 8120 | 10890 |
| 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) | 8430 | 9540 | 11610 | 14380 |
| 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) | 4980 | 3040 | 10020 | 11960 |
| 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) | 15090 | 11420 | 3820 | 2640 |
| 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 | 18580 | 10140 | 11320 |
| 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) | 9180 | 6340 | 1260 | 3270 |
| 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 | 16160 | 11730 | 13740 |

The Rx impacts can be identified as below,

* 2nd, 4th and 5th order IMD products generated by DC\_2\_n77 uplink may fall into own Rx of band 66
* 2nd, 4th and 5th order IMD products generated by DC\_66\_n77 uplink may fall into own Rx of band 2

5.76.3 ∆TIB and ∆RIB values

Table 5.76.3-1: ΔTIB,c

| Inter-band DC Configuration | E-UTRA and NR Band | ΔTIB,c [dB] |
| --- | --- | --- |
| DC\_2-66\_n77 | 2 | 0.6 |
| 66 | 0.6 |
| n77 | 0.8 |

**Table 5.76.4-2: ΔRIB,c**

| Inter-band DC Configuration | E-UTRA and NR Band | ΔRIB [dB] |
| --- | --- | --- |
| DC\_2-66\_n77 | 2 | 0.2 |
| 66 | 0.2 |
| n77 | 0.5 |

### 5.76.4 Reference sensitivity exceptions

As stated in 5.76.2, for MSD requirement caused by IMDs is specified below accordingly.

Table 5.76.4-1: MSD test points due to dual uplink operation for EN-DC in NR FR1 (three bands)

| NR or E-UTRA Band / Channel bandwidth / NRB / MSD | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- |
| EN-DC Configuration | EUTRA / NR band | UL Fc  (MHz) | UL/DL BW  (MHz) | UL  LCRB | DL Fc (MHz) | MSD  (dB) | IMD order |
| DC\_2A-66A\_n77A | 2 | 1855 | 5 | 25 | 1935 | N/A | N/A |
| 66 | 1765 | 5 | 25 | 2185 | 29.2 | IMD2 |
| n77 | 4040 | 5 | 25 | 4040 | N/A | N/A |
| 2 | 1905 | 5 | 25 | 1985 | M/A | N/A |
| 66 | 1720 | 5 | 25 | 2120 | 10.4 | IMD4 |
| n77 | 3595 | 5 | 25 | 3595 | N/A | N/A |
| 2 | 1885 | 5 | 25 | 1965 | M/A | N/A |
| 66 | 1775 | 5 | 25 | 2195 | 4.0 | IMD5 |
| n77 | 3925 | 5 | 25 | 3925 | N/A | N/A |
| 2 | 1880 | 5 | 25 | 1960 | 32.1 | IMD2 |
| 66 | 1740 | 5 | 25 | 2140 | N/A | N/A |
| n77 | 3700 | 5 | 25 | 3700 | N/A | N/A |
| 2 | 1860 | 5 | 25 | 1940 | 9.1 | IMD4 |
| 66 | 1775 | 5 | 25 | 2195 | N/A | N/A |
| n77 | 3385 | 5 | 25 | 3385 | N/A | N/A |
| 2 | 1900 | 5 | 25 | 1980 | 4.2 | IMD5 |
| 66 | 1770 | 5 | 25 | 2170 | N/A | N/A |
| n77 | 3645 | 5 | 25 | 3645 | N/A | N/A |

## 5.77 DC\_2-48\_n77

5.77.1 Operating bands for DC

Table 5.77.1-1: Inter-band DC configuration (three bands)

| DC  configuration | Uplink  configuration |
| --- | --- |
| DC\_2A-48A\_n77A | DC\_2A\_n77A  DC\_48A\_n77A |

5.77.2 Co-existence studies

For UE coexistence study of Band 2 + Band n77, the 2nd, 3rd, 4th and 5th order harmonics and 2nd, 3rd, 4th and 5th order intermodulation products were calculated and presented in Table 5.77.2-1.

Table 5.77.2-1: Harmonic and IMD analysis

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **UE UL carriers** | **fx\_low** | **fx\_high** | **fy\_low** | **fy\_high** |
| UL frequency (MHz) | 1850 | 1910 | 3300 | 4200 |
| 2nd harmonics frequency limits | 2\*fx\_low | 2\*fx\_high | 2\* fy\_low | 2\* fy\_high |
| 2nd harmonics frequency limits (MHz) | 3700 | 3820 | 6600 | 8400 |
| 3rd harmonics frequency limits | 3\*fx\_low | 3\*fx\_high | 3\* fy\_low | 3\* fy\_high |
| 3rd harmonics frequency limits (MHz) | 5550 | 5730 | 9900 | 12600 |
| 4th harmonics frequency limits | 4\*fx\_low | 4\*fx\_high | 4\*fy\_low | 4\*fy\_high |
| 4th harmonics frequency limits (MHz) | 7400 | 7640 | 13200 | 16800 |
| 5th harmonics frequency limits | 5\*fx\_low | 5\*fx\_high | 5\* fy\_low | 5\* fy\_high |
| 5th harmonics frequency limits (MHz) | 9250 | 9550 | 16500 | 21000 |
| Two tone 2nd order IMD products | fy\_low – fx\_high | fy\_high – fx\_low | fx\_low + fy\_low | fx\_high + fy\_high |
| IMD frequency limits (MHz) | 1390 | 2350 | 5150 | 6110 |
| 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) | 500 | 520 | 4690 | 6550 |
| 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) | 7000 | 8020 | 8450 | 10310 |
| 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) | 1350 | 2430 | 7990 | 10750 |
| 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) | 8850 | 9930 | 11750 | 14510 |
| 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) | 4700 | 2780 | 10300 | 12220 |
| 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) | 14950 | 11290 | 4340 | 3200 |
| 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 | 18710 | 10700 | 11840 |
| 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) | 8900 | 6080 | 870 | 2850 |
| 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 | 16420 | 12150 | 14130 |

For UE coexistence study of Band 48 + Band n77, the 2nd, 3rd, 4th and 5th order harmonics and 2nd, 3rd, 4th and 5th order intermodulation products were calculated and presented in Table 5.77.2-2.

Table 5.77.2-2: Harmonic and IMD analysis

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **UE UL carriers** | **fx\_low** | **fx\_high** | **fy\_low** | **fy\_high** |
| UL frequency (MHz) | 3550 | 3700 | 3300 | 4200 |
| 2nd harmonics frequency limits | 2\*fx\_low | 2\*fx\_high | 2\* fy\_low | 2\* fy\_high |
| 2nd harmonics frequency limits (MHz) | 7100 | 7400 | 6600 | 8400 |
| 3rd harmonics frequency limits | 3\*fx\_low | 3\*fx\_high | 3\* fy\_low | 3\* fy\_high |
| 3rd harmonics frequency limits (MHz) | 10650 | 11100 | 9900 | 12600 |
| 4th harmonics frequency limits | 4\*fx\_low | 4\*fx\_high | 4\*fy\_low | 4\*fy\_high |
| 4th harmonics frequency limits (MHz) | 14200 | 14800 | 13200 | 16800 |
| 5th harmonics frequency limits | 5\*fx\_low | 5\*fx\_high | 5\* fy\_low | 5\* fy\_high |
| 5th harmonics frequency limits (MHz) | 17750 | 18500 | 16500 | 21000 |
| Two tone 2nd order IMD products | fy\_low – fx\_high | fy\_high – fx\_low | fx\_low + fy\_low | fx\_high + fy\_high |
| IMD frequency limits (MHz) | 400 | 650 | 6850 | 7900 |
| 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) | 2900 | 4100 | 2900 | 4850 |
| 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) | 10400 | 11600 | 10150 | 12100 |
| 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) | 6450 | 7800 | 6200 | 9050 |
| 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) | 13950 | 15300 | 13450 | 16300 |
| 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 | 800 | 13700 | 15800 |
| 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) | 13250 | 9500 | 11500 | 10000 |
| 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) | 16750 | 20500 | 17500 | 19000 |
| 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) | 5500 | 2500 | 4500 | 2250 |
| 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) | 17000 | 20000 | 17250 | 19500 |

The Rx impacts can be identified as below,

* There is no IMD issue for Rx of band 2 with UL DC\_48\_n77.
* 5th order harmonics generated by DC\_2\_n77 uplink may fall into own Rx of band 48.
* As the duplex mode for band 48 and n77 is TDD and both bands shall be synchronized to align uplink and downlink timing across and within the two bands for the U.S. C-band (R4-2008118), thus there is no impact to this TDD band 48 with the UL DC\_2\_n77.

5.77.3 ∆TIB and ∆RIB values

Table 5.77.3-1: ΔTIB,c

| Inter-band DC Configuration | E-UTRA and NR Band | ΔTIB,c [dB] |
| --- | --- | --- |
| DC\_2-48\_n77 | 2 | 0.3 |
| 48 | 0.6 |
| n77 | 0.5 |

**Table 5.77.3-2: ΔRIB,c**

| Inter-band DC Configuration | E-UTRA and NR Band | ΔRIB [dB] |
| --- | --- | --- |
| DC\_2-48\_n77 | 2 | 0 |
| 48 | 0.2 |
| n77 | 0.1 |

### 5.77.4 Reference sensitivity exceptions

There is no reference sensitivity exception (MSD) for DC\_2-48\_n77 combination.

## 5.78 DC\_2-13\_n77

5.78.1 Operating bands for DC

Table 5.78.1-1: Inter-band DC configurations (three bands)

| DC configuration | Uplink configuration |
| --- | --- |
| DC\_2A-13A\_n77A | DC\_2A\_n77A DC\_13A\_n77A |

5.78.2 Co-existence studies

For UE coexistence study of Band 2 + Band n77, the 2nd, 3rd, 4th and 5th order harmonics and 2nd, 3rd, 4th and 5th order intermodulation products were calculated and presented in Table 5.78.2-1.

Table 5.78.2-1: Harmonic and IMD analysis

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **UE UL carriers** | **fx\_low** | **fx\_high** | **fy\_low** | **fy\_high** |
| UL frequency (MHz) | 1850 | 1910 | 3300 | 4200 |
| 2nd harmonics frequency limits | 2\*fx\_low | 2\*fx\_high | 2\* fy\_low | 2\* fy\_high |
| 2nd harmonics frequency limits (MHz) | 3700 | 3820 | 6600 | 8400 |
| 3rd harmonics frequency limits | 3\*fx\_low | 3\*fx\_high | 3\* fy\_low | 3\* fy\_high |
| 3rd harmonics frequency limits (MHz) | 5550 | 5730 | 9900 | 12600 |
| 4th harmonics frequency limits | 4\*fx\_low | 4\*fx\_high | 4\*fy\_low | 4\*fy\_high |
| 4th harmonics frequency limits (MHz) | 7400 | 7640 | 13200 | 16800 |
| 5th harmonics frequency limits | 5\*fx\_low | 5\*fx\_high | 5\* fy\_low | 5\* fy\_high |
| 5th harmonics frequency limits (MHz) | 9250 | 9550 | 16500 | 21000 |
| Two tone 2nd order IMD products | fy\_low – fx\_high | fy\_high – fx\_low | fx\_low + fy\_low | fx\_high + fy\_high |
| IMD frequency limits (MHz) | 1390 | 2350 | 5150 | 6110 |
| 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) | 500 | 520 | 4690 | 6550 |
| 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) | 7000 | 8020 | 8450 | 10310 |
| 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) | 1350 | 2430 | 7990 | 10750 |
| 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) | 8850 | 9930 | 11750 | 14510 |
| 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) | 4700 | 2780 | 10300 | 12220 |
| 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) | 14950 | 11290 | 4340 | 3200 |
| 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 | 18710 | 10700 | 11840 |
| 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) | 8900 | 6080 | 870 | 2850 |
| 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 | 16420 | 12150 | 14130 |

For UE coexistence study of Band 13 + Band n77, the 2nd, 3rd, 4th and 5th order harmonics and 2nd, 3rd, 4th and 5th order intermodulation products were calculated and presented in Table 5.78.2-2.

Table 5.78.2-2: Harmonic and IMD analysis

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **UE UL carriers** | **fx\_low** | **fx\_high** | **fy\_low** | **fy\_high** |
| UL frequency (MHz) | 777 | 787 | 3300 | 4200 |
| 2nd harmonics frequency limits | 2\*fx\_low | 2\*fx\_high | 2\* fy\_low | 2\* fy\_high |
| 2nd harmonics frequency limits (MHz) | 1554 | 1574 | 6600 | 8400 |
| 3rd harmonics frequency limits | 3\*fx\_low | 3\*fx\_high | 3\* fy\_low | 3\* fy\_high |
| 3rd harmonics frequency limits (MHz) | 2331 | 2361 | 9900 | 12600 |
| 4th harmonics frequency limits | 4\*fx\_low | 4\*fx\_high | 4\*fy\_low | 4\*fy\_high |
| 4th harmonics frequency limits (MHz) | 3108 | 3148 | 13200 | 16800 |
| 5th harmonics frequency limits | 5\*fx\_low | 5\*fx\_high | 5\* fy\_low | 5\* fy\_high |
| 5th harmonics frequency limits (MHz) | 3885 | 3935 | 16500 | 21000 |
| Two tone 2nd order IMD products | fy\_low – fx\_high | fy\_high – fx\_low | fx\_low + fy\_low | fx\_high + fy\_high |
| IMD frequency limits (MHz) | 2513 | 3423 | 4077 | 4987 |
| 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) | 2646 | 1726 | 5813 | 7623 |
| 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) | 4854 | 5774 | 7377 | 9187 |
| 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) | 1869 | 939 | 9113 | 11823 |
| 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) | 5631 | 6561 | 10677 | 13387 |
| 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) | 6846 | 5026 | 8154 | 9974 |
| 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) | 16023 | 12413 | 152 | 1092 |
| 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) | 13977 | 17587 | 6408 | 7348 |
| 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) | 11046 | 8326 | 4239 | 6069 |
| 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) | 11454 | 14174 | 8931 | 10761 |

The Rx impacts can be identified as below,

* There is no IMD issue for Rx of band 13 with UL DC\_2\_n77.
* 3rd order IMD products generated by DC\_13\_n77 uplink may fall into own Rx of band 2

5.78.3 ∆TIB and ∆RIB values

Table 5.78.3-1: ΔTIB,c

| Inter-band DC Configuration | E-UTRA and NR Band | ΔTIB,c [dB] |
| --- | --- | --- |
| DC\_2-13\_n77 | 2 | 0.6 |
| 13 | 0.5 |
| n77 | 0.8 |

**Table 5.78.3-2: ΔRIB,c**

| Inter-band DC Configuration | E-UTRA and NR Band | ΔRIB [dB] |
| --- | --- | --- |
| DC\_2-13\_n77 | 2 | 0.2 |
| 13 | 0.2 |
| n77 | 0.5 |

### 5.78.4 Reference sensitivity exceptions

As stated in 5.78.2, for MSD requirement caused by IMDs is specified below accordingly.

Table 5.78.4-1: MSD test points 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-13A\_n77A | 2 | 1864 | 5 | 25 | 1944 | 16.0 | IMD3 |
| 13 | 783 | 5 | 25 | 752 | N/A | N/A |
| n77 | 3510 | 5 | 25 | 3510 | N/A | N/A |

## 5.79 DC\_2-5\_n77

5.79.1 Operating bands for DC

Table 5.79.1-1: Inter-band DC configurations (three bands)

| DC configuration | Uplink configuration |
| --- | --- |
| DC\_2A-5A\_n77A | DC\_2A\_n77A DC\_5A\_n77A |

5.79.2 Co-existence studies

For UE coexistence study of Band 2 + Band n77, the 2nd, 3rd, 4th and 5th order harmonics and 2nd, 3rd, 4th and 5th order intermodulation products were calculated and presented in Table 5.79.2-1.

Table 5.79.2-1: Harmonic and IMD analysis

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **UE UL carriers** | **fx\_low** | **fx\_high** | **fy\_low** | **fy\_high** |
| UL frequency (MHz) | 1850 | 1910 | 3300 | 4200 |
| 2nd harmonics frequency limits | 2\*fx\_low | 2\*fx\_high | 2\* fy\_low | 2\* fy\_high |
| 2nd harmonics frequency limits (MHz) | 3700 | 3820 | 6600 | 8400 |
| 3rd harmonics frequency limits | 3\*fx\_low | 3\*fx\_high | 3\* fy\_low | 3\* fy\_high |
| 3rd harmonics frequency limits (MHz) | 5550 | 5730 | 9900 | 12600 |
| 4th harmonics frequency limits | 4\*fx\_low | 4\*fx\_high | 4\*fy\_low | 4\*fy\_high |
| 4th harmonics frequency limits (MHz) | 7400 | 7640 | 13200 | 16800 |
| 5th harmonics frequency limits | 5\*fx\_low | 5\*fx\_high | 5\* fy\_low | 5\* fy\_high |
| 5th harmonics frequency limits (MHz) | 9250 | 9550 | 16500 | 21000 |
| Two tone 2nd order IMD products | fy\_low – fx\_high | fy\_high – fx\_low | fx\_low + fy\_low | fx\_high + fy\_high |
| IMD frequency limits (MHz) | 1390 | 2350 | 5150 | 6110 |
| 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) | 500 | 520 | 4690 | 6550 |
| 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) | 7000 | 8020 | 8450 | 10310 |
| 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) | 1350 | 2430 | 7990 | 10750 |
| 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) | 8850 | 9930 | 11750 | 14510 |
| 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) | 4700 | 2780 | 10300 | 12220 |
| 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) | 14950 | 11290 | 4340 | 3200 |
| 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 | 18710 | 10700 | 11840 |
| 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) | 8900 | 6080 | 870 | 2850 |
| 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 | 16420 | 12150 | 14130 |

For UE coexistence study of Band 5 + Band n77, the 2nd, 3rd, 4th and 5th order harmonics and 2nd, 3rd, 4th and 5th order intermodulation products were calculated and presented in Table 5.79.2-2.

Table 5.79.2-2: Harmonic and IMD analysis

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **UE UL carriers** | **fx\_low** | **fx\_high** | **fy\_low** | **fy\_high** |
| UL frequency (MHz) | 824 | 849 | 3300 | 4200 |
| 2nd harmonics frequency limits | 2\*fx\_low | 2\*fx\_high | 2\* fy\_low | 2\* fy\_high |
| 2nd harmonics frequency limits (MHz) | 1648 | 1698 | 6600 | 8400 |
| 3rd harmonics frequency limits | 3\*fx\_low | 3\*fx\_high | 3\* fy\_low | 3\* fy\_high |
| 3rd harmonics frequency limits (MHz) | 2472 | 2547 | 9900 | 12600 |
| 4th harmonics frequency limits | 4\*fx\_low | 4\*fx\_high | 4\*fy\_low | 4\*fy\_high |
| 4th harmonics frequency limits (MHz) | 3296 | 3396 | 13200 | 16800 |
| 5th harmonics frequency limits | 5\*fx\_low | 5\*fx\_high | 5\* fy\_low | 5\* fy\_high |
| 5th harmonics frequency limits (MHz) | 4120 | 4245 | 16500 | 21000 |
| Two tone 2nd order IMD products | fy\_low – fx\_high | fy\_high – fx\_low | fx\_low + fy\_low | fx\_high + fy\_high |
| IMD frequency limits (MHz) | 2451 | 3376 | 4124 | 5049 |
| 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) | 2552 | 1602 | 5751 | 7576 |
| 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) | 4948 | 5898 | 7424 | 9249 |
| 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) | 1728 | 753 | 9051 | 11776 |
| 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) | 5772 | 6747 | 10724 | 13449 |
| 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) | 6752 | 4902 | 8248 | 10098 |
| 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) | 15976 | 12351 | 96 | 904 |
| 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) | 14024 | 17649 | 6596 | 7596 |
| 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) | 10952 | 8202 | 4053 | 5928 |
| 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) | 11548 | 14298 | 9072 | 10947 |

The Rx impacts can be identified as below..

* 5th order IMD products generated by DC\_2\_n77 uplink may fall into own Rx of band 5.
* 3rd order IMD products generated by DC\_5\_n77 uplink may fall into own Rx of band 2.

5.79.3 ∆TIB and ∆RIB values

Table 5.79.3-1: ΔTIB,

| Inter-band DC Configuration | E-UTRA and NR Band | ΔTIB,c [dB] |
| --- | --- | --- |
| DC\_2-5\_n77 | 2 | 0.6 |
| 5 | 0.6 |
| n77 | 0.8 |

**Table 5.79.3-2: ΔRIB,c**

| Inter-band DC Configuration | E-UTRA and NR Band | ΔRIB [dB] |
| --- | --- | --- |
| DC\_2-5\_n77 | 2 | 0.2 |
| 5 | 0.2 |
| n77 | 0.5 |

### 5.79.4 Reference sensitivity exceptions

As stated in 5.79.2, for MSD requirement caused by IMDs is specified below accordingly.

Table 5.79.5-1: MSD test points 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-5A\_n77A | 2 | 1907.5 | 5 | 25 | 1987.5 | N/A | N/A |
| 5 | 842.5 | 5 | 25 | 887.5 | 3.8 | IMD5 |
| n77 | 3305 | 5 | 25 | 3305 | N/A | N/A |
| 2 | 1907 | 5 | 25 | 1987 | 16.5 | IMD3 |
| 5 | 846.5 | 5 | 25 | 891.5 | N/A | N/A |
| n77 | 3680 | 5 | 25 | 3680 | N/A | N/A |

## 5.80 DC\_5-13\_n66

5.80.1 Operating bands for DC

Table 5.80.1-1: Inter-band DC configurations (three bands)

| DC  configuration | Uplink configuration |
| --- | --- |
| DC\_5A-13A\_n66A | DC\_5A\_n66A  DC\_13A\_n66A |

5.80.2 Co-existence studies

For UE coexistence study of Band 5 + Band n66, the 2nd, 3rd, 4th and 5th order harmonics and 2nd, 3rd, 4th and 5th order intermodulation products were calculated and presented in Table 5.80.2-1.

Table 5.80.2-1: Harmonic and IMD analysis

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **UE UL carriers** | **fx\_low** | **fx\_high** | **fy\_low** | **fy\_high** |
| UL frequency (MHz) | 824 | 849 | 1710 | 1780 |
| 2nd harmonics frequency limits | 2\*fx\_low | 2\*fx\_high | 2\* fy\_low | 2\* fy\_high |
| 2nd harmonics frequency limits (MHz) | 1648 | 1698 | 3420 | 3560 |
| 3rd harmonics frequency limits | 3\*fx\_low | 3\*fx\_high | 3\* fy\_low | 3\* fy\_high |
| 3rd harmonics frequency limits (MHz) | 2472 | 2547 | 5130 | 5340 |
| 4th harmonics frequency limits | 4\*fx\_low | 4\*fx\_high | 4\*fy\_low | 4\*fy\_high |
| 4th harmonics frequency limits (MHz) | 3296 | 3396 | 6840 | 7120 |
| 5th harmonics frequency limits | 5\*fx\_low | 5\*fx\_high | 5\* fy\_low | 5\* fy\_high |
| 5th harmonics frequency limits (MHz) | 4120 | 4245 | 8550 | 8900 |
| Two tone 2nd order IMD products | fy\_low – fx\_high | fy\_high – fx\_low | fx\_low + fy\_low | fx\_high + fy\_high |
| IMD frequency limits (MHz) | 861 | 956 | 2534 | 2629 |
| 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) | 132 | 12 | 2571 | 2736 |
| 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) | 3358 | 3478 | 4244 | 4409 |
| 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) | 692 | 837 | 4281 | 4516 |
| 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) | 4182 | 4327 | 5954 | 6189 |
| 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) | 1912 | 1722 | 5068 | 5258 |
| 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) | 6296 | 5991 | 1686 | 1516 |
| 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) | 7664 | 7969 | 5006 | 5176 |
| 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) | 3692 | 3432 | 873 | 1088 |
| 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) | 6778 | 7038 | 5892 | 6107 |

For UE coexistence study of Band 13 + Band n66, the 2nd, 3rd, 4th and 5th order harmonics and 2nd, 3rd, 4th and 5th order intermodulation products were calculated and presented in Table 5.80.2-2.

Table 5.80.2-2: Harmonic and IMD analysis

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **UE UL carriers** | **fx\_low** | **fx\_high** | **fy\_low** | **fy\_high** |
| UL frequency (MHz) | 777 | 787 | 1710 | 1780 |
| 2nd harmonics frequency limits | 2\*fx\_low | 2\*fx\_high | 2\* fy\_low | 2\* fy\_high |
| 2nd harmonics frequency limits (MHz) | 1554 | 1574 | 3420 | 3560 |
| 3rd harmonics frequency limits | 3\*fx\_low | 3\*fx\_high | 3\* fy\_low | 3\* fy\_high |
| 3rd harmonics frequency limits (MHz) | 2331 | 2361 | 5130 | 5340 |
| 4th harmonics frequency limits | 4\*fx\_low | 4\*fx\_high | 4\*fy\_low | 4\*fy\_high |
| 4th harmonics frequency limits (MHz) | 3108 | 3148 | 6840 | 7120 |
| 5th harmonics frequency limits | 5\*fx\_low | 5\*fx\_high | 5\* fy\_low | 5\* fy\_high |
| 5th harmonics frequency limits (MHz) | 3885 | 3935 | 8550 | 8900 |
| Two tone 2nd order IMD products | fy\_low – fx\_high | fy\_high – fx\_low | fx\_low + fy\_low | fx\_high + fy\_high |
| IMD frequency limits (MHz) | 923 | 1003 | 2487 | 2567 |
| 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) | 226 | 136 | 2633 | 2783 |
| 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) | 3264 | 3354 | 4197 | 4347 |
| 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) | 551 | 651 | 4343 | 4563 |
| 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) | 4041 | 4141 | 5907 | 6127 |
| 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) | 2006 | 1846 | 4974 | 5134 |
| 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) | 6343 | 6053 | 1438 | 1328 |
| 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) | 7617 | 7907 | 4818 | 4928 |
| 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) | 3786 | 3556 | 1059 | 1229 |
| 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) | 6684 | 6914 | 5751 | 5921 |

The Rx impacts can be identified as below..

* 4th order IMD products generated by DC\_5\_n66 uplink may fall into own Rx of band 13.
* There is no IMD issue for Rx of band 5 with UL DC\_13\_n66.

5.80.3 ∆TIB and ∆RIB values

Table 5.80.3-1: ΔTIB,c

| Inter-band DC Configuration | E-UTRA and NR Band | ΔTIB,c [dB] |
| --- | --- | --- |
| DC\_5-13\_n66 | 5 | 0.3 |
| 13 | 0.3 |
| n66 | 0.3 |

**Table 5.80.4-2: ΔRIB,c**

| Inter-band DC Configuration | E-UTRA and NR Band | ΔRIB [dB] |
| --- | --- | --- |
| DC\_5-13\_n66 | 5 | 0 |
| 13 | 0 |
| n66 | 0 |

### 5.80.4 Reference sensitivity exceptions

As stated in 5.80.2, the requirement caused by IMDs is specified below accordingly.

Table 5.80.4-1: MSD test points 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\_5A-13A\_n66A | 5 | 840 | 5 | 25 | 885 | N/A | N/A |
| 13 | 781 | 5 | 25 | 750 | 9.4 | IMD4 |
| n66 | 1770 | 5 | 25 | 2170 | N/A | N/A |

## 5.81 DC\_13-66\_n77

5.81.1 Operating bands for DC

Table 5.81.1-1: Inter-band DC configurations (three bands)

| DC configuration | Uplink configuration |
| --- | --- |
| DC\_13A-66A\_n77A | DC\_13A\_n77A DC\_66A\_n77A |

5.81.2 Co-existence studies

For UE coexistence study of Band 13 + Band n77, the 2nd, 3rd, 4th and 5th order harmonics and 2nd, 3rd, 4th and 5th order intermodulation products were calculated and presented in Table 5.81.2-1.

Table 5.81.2-1: Harmonic and IMD analysis

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **UE UL carriers** | **fx\_low** | **fx\_high** | **fy\_low** | **fy\_high** |
| UL frequency (MHz) | 777 | 787 | 3300 | 4200 |
| 2nd harmonics frequency limits | 2\*fx\_low | 2\*fx\_high | 2\* fy\_low | 2\* fy\_high |
| 2nd harmonics frequency limits (MHz) | 1554 | 1574 | 6600 | 8400 |
| 3rd harmonics frequency limits | 3\*fx\_low | 3\*fx\_high | 3\* fy\_low | 3\* fy\_high |
| 3rd harmonics frequency limits (MHz) | 2331 | 2361 | 9900 | 12600 |
| 4th harmonics frequency limits | 4\*fx\_low | 4\*fx\_high | 4\*fy\_low | 4\*fy\_high |
| 4th harmonics frequency limits (MHz) | 3108 | 3148 | 13200 | 16800 |
| 5th harmonics frequency limits | 5\*fx\_low | 5\*fx\_high | 5\* fy\_low | 5\* fy\_high |
| 5th harmonics frequency limits (MHz) | 3885 | 3935 | 16500 | 21000 |
| Two tone 2nd order IMD products | fy\_low – fx\_high | fy\_high – fx\_low | fx\_low + fy\_low | fx\_high + fy\_high |
| IMD frequency limits (MHz) | 2513 | 3423 | 4077 | 4987 |
| 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) | 2646 | 1726 | 5813 | 7623 |
| 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) | 4854 | 5774 | 7377 | 9187 |
| 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) | 1869 | 939 | 9113 | 11823 |
| 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) | 5631 | 6561 | 10677 | 13387 |
| 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) | 6846 | 5026 | 8154 | 9974 |
| 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) | 16023 | 12413 | 152 | 1092 |
| 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) | 13977 | 17587 | 6408 | 7348 |
| 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) | 11046 | 8326 | 4239 | 6069 |
| 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) | 11454 | 14174 | 8931 | 10761 |

For UE coexistence study of Band 66 + Band n77, the 2nd, 3rd, 4th and 5th order harmonics and 2nd, 3rd, 4th and 5th order intermodulation products were calculated and presented in Table 5.81.2-2.

Table 5.81.2-2: Harmonic and IMD analysis

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **UE UL carriers** | **fx\_low** | **fx\_high** | **fy\_low** | **fy\_high** |
| UL frequency (MHz) | 1710 | 1780 | 3300 | 4200 |
| 2nd harmonics frequency limits | 2\*fx\_low | 2\*fx\_high | 2\* fy\_low | 2\* fy\_high |
| 2nd harmonics frequency limits (MHz) | 3420 | 3560 | 6600 | 8400 |
| 3rd harmonics frequency limits | 3\*fx\_low | 3\*fx\_high | 3\* fy\_low | 3\* fy\_high |
| 3rd harmonics frequency limits (MHz) | 5130 | 5340 | 9900 | 12600 |
| 4th harmonics frequency limits | 4\*fx\_low | 4\*fx\_high | 4\*fy\_low | 4\*fy\_high |
| 4th harmonics frequency limits (MHz) | 6840 | 7120 | 13200 | 16800 |
| 5th harmonics frequency limits | 5\*fx\_low | 5\*fx\_high | 5\* fy\_low | 5\* fy\_high |
| 5th harmonics frequency limits (MHz) | 8550 | 8900 | 16500 | 21000 |
| Two tone 2nd order IMD products | fy\_low – fx\_high | fy\_high – fx\_low | fx\_low + fy\_low | fx\_high + fy\_high |
| IMD frequency limits (MHz) | 1520 | 2490 | 5010 | 5980 |
| 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) | 780 | 260 | 4820 | 6690 |
| 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) | 6720 | 7760 | 8310 | 10180 |
| 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) | 930 | 2040 | 8120 | 10890 |
| 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) | 8430 | 9540 | 11610 | 14380 |
| 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) | 4980 | 3040 | 10020 | 11960 |
| 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) | 15090 | 11420 | 3820 | 2640 |
| 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 | 18580 | 10140 | 11320 |
| 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) | 9180 | 6340 | 1260 | 3270 |
| 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 | 16160 | 11730 | 13740 |

The Rx impacts can be identified as below..

* 3rd order IMD products generated by DC\_13\_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 13

5.81.3 ∆TIB and ∆RIB values

Table 5.81.3-1: ΔTIB,c

| Inter-band DC Configuration | E-UTRA and NR Band | ΔTIB,c [dB] |
| --- | --- | --- |
| DC\_13-66\_n77 | 13 | 0.5 |
| 66 | 0.6 |
| n77 | 0.8 |

**Table 5.81.3-2: ΔRIB,c**

| Inter-band DC Configuration | E-UTRA and NR Band | ΔRIB [dB] |
| --- | --- | --- |
| DC\_13-66\_n77 | 13 | 0.3 |
| 66 | 0.3 |
| n77 | 0.5 |

5.81.4 Reference sensitivity exceptions

As stated in 5.81.2, for MSD requirement caused by IMDs is specified below accordingly.

Table 5.81.4-1: MSD test points 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\_13A-66A\_n77A | 13 | 777 | 5 | 25 | 746 | N/A | N/A |
| 66 | 1746 | 5 | 25 | 2146 | 17.1 | IMD3 |
| n77 | 3700 | 10 | 50 | 3700 | N/A | N/A |
| 13 | 781 | 5 | 25 | 750 | 15.2 | IMD3 |
| 66 | 1710 | 5 | 25 | 2110 | N/A | N/A |
| n77 | 4170 | 10 | 50 | 4170 | N/A | N/A |

## 5.82 DC\_13-66\_n5

5.82.1 Operating bands for DC

Table 5.82.1-1: Inter-band DC configurations (three bands)

| DC  configuration | Uplink configuration |
| --- | --- |
| DC\_13A-66A\_n5A | DC\_13A\_n5A  DC\_66A\_n5A |

5.82.2 Co-existence studies

For UE coexistence study of Band 13 + Band n5, the 2nd, 3rd, 4th and 5th order harmonics and 2nd, 3rd, 4th and 5th order intermodulation products were calculated and presented in Table 5.82.2-1.

Table 5.82.2-1: Harmonic and IMD analysis

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **UE UL carriers** | **fx\_low** | **fx\_high** | **fy\_low** | **fy\_high** |
| UL frequency (MHz) | 777 | 787 | 824 | 849 |
| 2nd harmonics frequency limits | 2\*fx\_low | 2\*fx\_high | 2\* fy\_low | 2\* fy\_high |
| 2nd harmonics frequency limits (MHz) | 1554 | 1574 | 1648 | 1698 |
| 3rd harmonics frequency limits | 3\*fx\_low | 3\*fx\_high | 3\* fy\_low | 3\* fy\_high |
| 3rd harmonics frequency limits (MHz) | 2331 | 2361 | 2472 | 2547 |
| 4th harmonics frequency limits | 4\*fx\_low | 4\*fx\_high | 4\*fy\_low | 4\*fy\_high |
| 4th harmonics frequency limits (MHz) | 3108 | 3148 | 3296 | 3396 |
| 5th harmonics frequency limits | 5\*fx\_low | 5\*fx\_high | 5\* fy\_low | 5\* fy\_high |
| 5th harmonics frequency limits (MHz) | 3885 | 3935 | 4120 | 4245 |
| Two tone 2nd order IMD products | fy\_low – fx\_high | fy\_high – fx\_low | fx\_low + fy\_low | fx\_high + fy\_high |
| IMD frequency limits (MHz) | 37 | 72 | 1601 | 1636 |
| 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) | 705 | 750 | 861 | 921 |
| 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) | 2378 | 2423 | 2425 | 2485 |
| 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) | 1482 | 1537 | 1685 | 1770 |
| 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) | 3155 | 3210 | 3249 | 3334 |
| 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) | 144 | 74 | 3202 | 3272 |
| 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) | 2619 | 2509 | 2324 | 2259 |
| 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) | 4073 | 4183 | 3932 | 3997 |
| 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) | 993 | 898 | 713 | 633 |
| 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) | 4026 | 4121 | 3979 | 4059 |

For UE coexistence study of Band 66 + Band n5, the 2nd, 3rd, 4th and 5th order harmonics and 2nd, 3rd, 4th and 5th order intermodulation products were calculated and presented in Table 5.82.2-2.

Table 5.82.2-2: Harmonic and IMD analysis

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **UE UL carriers** | **fx\_low** | **fx\_high** | **fy\_low** | **fy\_high** |
| UL frequency (MHz) | 1710 | 1780 | 824 | 849 |
| 2nd harmonics frequency limits | 2\*fx\_low | 2\*fx\_high | 2\* fy\_low | 2\* fy\_high |
| 2nd harmonics frequency limits (MHz) | 3420 | 3560 | 1648 | 1698 |
| 3rd harmonics frequency limits | 3\*fx\_low | 3\*fx\_high | 3\* fy\_low | 3\* fy\_high |
| 3rd harmonics frequency limits (MHz) | 5130 | 5340 | 2472 | 2547 |
| 4th harmonics frequency limits | 4\*fx\_low | 4\*fx\_high | 4\*fy\_low | 4\*fy\_high |
| 4th harmonics frequency limits (MHz) | 6840 | 7120 | 3296 | 3396 |
| 5th harmonics frequency limits | 5\*fx\_low | 5\*fx\_high | 5\* fy\_low | 5\* fy\_high |
| 5th harmonics frequency limits (MHz) | 8550 | 8900 | 4120 | 4245 |
| Two tone 2nd order IMD products | fy\_low – fx\_high | fy\_high – fx\_low | fx\_low + fy\_low | fx\_high + fy\_high |
| IMD frequency limits (MHz) | 956 | 861 | 2534 | 2629 |
| 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) | 2571 | 2736 | 132 | 12 |
| 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) | 4244 | 4409 | 3358 | 3478 |
| 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) | 4281 | 4516 | 692 | 837 |
| 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) | 5954 | 6189 | 4182 | 4327 |
| 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) | 1722 | 1912 | 5068 | 5258 |
| 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) | 1686 | 1516 | 6296 | 5991 |
| 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) | 5006 | 5176 | 7664 | 7969 |
| 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) | 873 | 1088 | 3692 | 3432 |
| 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) | 5892 | 6107 | 6778 | 7038 |

The Rx impacts can be identified as below..

* There is no IMD issue for Rx of band 66 with UL DC\_13\_n5.
* 4th order IMD products generated by DC\_66\_n77 uplink may fall into own Rx of band 13.

5.82.3 ∆TIB and ∆RIB values

Table 5.82.3-1: ΔTIB,c

| Inter-band DC Configuration | E-UTRA and NR Band | ΔTIB,c [dB] |
| --- | --- | --- |
| DC\_13-66\_n5 | 13 | 0.5 |
| 66 | 0.3 |
| n5 | 0.5 |

**Table 5.82.3-2: ΔRIB,c**

| Inter-band DC Configuration | E-UTRA and NR Band | ΔRIB [dB] |
| --- | --- | --- |
| DC\_13-66\_n5 | 13 | 0 |
| 66 | 0 |
| n5 | 0 |

### 5.82.4 Reference sensitivity exceptions

As stated in 5.82.2, the requirement caused by IMDs is specified below accordingly.

Table 5.82.5-1: MSD test points 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\_13A-66A\_n5A | 13 | 781 | 5 | 25 | 750 | 9.4 | IMD4 |
| 66 | 1770 | 5 | 25 | 2170 | N/A | N/A |
| n5 | 840 | 5 | 25 | 885 | N/A | N/A |

## 5.83 DC\_1-18\_n28

### 5.83.1 Configurations for DC

Table 5.83.1-1: Inter-band DC configurations (three bands)

| DC  configuration | Uplink configuration |
| --- | --- |
| DC\_1A-18A\_n28A | DC\_1A\_n28A  DC\_18A\_n28A |

### 5.83.2 Co-existence studies

Based on co-existence studies of DC\_1\_n28 and DC\_18\_n28, 5th order IMD generated by dual uplink of Band 18 + Band n28 may fall into own Rx of band 1. The MSD value of this configuration can follow CA\_1A-18A-28A with UL CA\_18A-28A case. Since band 18 is only used by KDDI, no additional MSD requirement need to be specified for this configuration considering KDDI spectrum (band n28 UL is limited to 718MHz – 728MHz).

### 5.83.3 ∆TIB and ∆RIB values

For DC\_1-18\_n28, the ΔTIB,c and ΔRIB,c values are given in the tables below.

Table 5.83.3-1: ΔTIB,c

| Inter-band DC Configuration | E-UTRA and NR Band | ΔTIB,c [dB] |
| --- | --- | --- |
| DC\_1-18\_n28 | 1 | 0.3 |
| 18 | 0.5 |
| n28 | 0.5 |

**Table 5.83.3-2: ΔRIB**

| Inter-band DC Configuration | E-UTRA and NR Band | ΔRIB [dB] |
| --- | --- | --- |
| DC\_1-18\_n28 | 1 | 0 |
| 18 | 0 |
| n28 | 0 |

### 5.83.4 Reference sensitivity exceptions

As stated in 5.83.2, there is no additional MSD requirement for this configuration.

## 5.84 DC\_1-18\_n41

### 5.84.1 Configurations for DC

Table 5.84.1-1: Inter-band DC configurations (three bands)

| DC  configuration | Uplink configuration |
| --- | --- |
| DC\_1A-18A\_n41A | DC\_1A\_n41A  DC\_18A\_n41A |

### 5.84.2 Co-existence studies

Based on co-existence studies of DC\_1\_n41 and DC\_18\_n41, 5th order IMD generated by dual uplink of Band 1 + Band n41 may fall into own Rx of band 18. The MSD value of this configuration can follow CA\_1A-18A-41A with UL CA\_1A-41A case. Since band 18 is only used by KDDI, no additional MSD requirement need to be specified for this configuration considering KDDI spectrum (band n41 is limited to 2595MHz – 2645MHz).

### 5.84.3 ∆TIB and ∆RIB values

For DC\_1-18\_n41, the ΔTIB,c and ΔRIB,c values are given in the tables below.

Table 5.84.3-1: ΔTIB,c

| Inter-band DC Configuration | E-UTRA and NR Band | ΔTIB,c [dB] |
| --- | --- | --- |
| DC\_1-18\_n41 | 1 | 0.5 |
| 18 | 0.3 |
| n41 | 0.5 |

**Table 5.84.3-2: ΔRIB**

| Inter-band DC Configuration | E-UTRA and NR Band | ΔRIB [dB] |
| --- | --- | --- |
| DC\_1-18\_n41 | 1 | 0 |
| 18 | 0 |
| n41 | 0 |

### 5.84.4 Reference sensitivity exceptions

As stated in 5.84.2, there is no additional MSD requirement for this configuration.

## 5.85 DC\_5-7\_n7

5.85.1 Configurations for DC

Table 5.85.1-1: Inter-band DC configurations (three bands)

| DC  Configuration | Uplink DC  configuration |
| --- | --- |
| DC\_5A-7A\_n7A | DC\_5A\_n7A DC\_7A\_n7A2 |
| NOTE 2: Only single switched UL is supported | |

### 5.85.2 Co-existence studies

Co-existence studies have been performed for lower order combinations.

Co-existence analysis for DC\_5\_n7 UL shows that 3rd and 5th IMD may fall in DL band 5.

Co-existence analysis for DC\_7\_n7 UL is not needed since only switched UL is supported.

5.85.3 ∆TIB and ∆RIB values

Table 5.85.3-1: ΔTIB,c

| Inter-band DC configuration | E-UTRA or NR Band | ΔTIB,c (dB) |
| --- | --- | --- |
| DC\_5-7\_n7 | 5 | 0.5 |
| 7 | 0.3 |
| n7 | 0.3 |

Table 5.85.3-2: ΔRIB

| Inter-band DC configuration | E-UTRA or NR Band | ΔRIB,c (dB) |
| --- | --- | --- |
| DC\_5-7\_n7 | 5 | 0 |
| 7 | 0 |
| n7 | 0 |

5.85.4 Reference sensitivity exceptions

Based on co-existence studies additional MSD is needed defined in Table 7.3B.2.3.5.2-1 of 38.101-3.

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\_5A-7A\_n7A | 5 | 834 | 5 | 25 | 879 | 12 | IMD34 |
| 7 | 2527 | 10 | 50 | 2647 | N/A | N/A |
| n7 | 2547 | 10 | 50 | 2667 | N/A | N/A |
| NOTE 4: This band is subject to IMD5 also which MSD is not specified. | | | | | | | |

## 5.86 DC\_2-28\_n7

5.86.1 Configurations for DC

Table 5.86.1-1: Inter-band DC configurations (three bands)

| DC  Configuration | Uplink DC  configuration |
| --- | --- |
| DC\_2A-28A\_n7A | DC\_2A\_n7A DC\_28A\_n7A |
|  | |

### 5.86.2 Co-existence studies

Co-existence studies have been performed for lower order combinations. of DC\_2A\_n7A and DC\_28A\_n7A, where:

- No IMD product caused by DC\_2A\_n7A fall into own Rx of band 28.

- No IMD product caused by DC\_28A\_n7A fall into own Rx of band 2.

5.86.3 ∆TIB and ∆RIB values

Table 5.86.3-1: ΔTIB,c

| Inter-band DC configuration | E-UTRA or NR Band | ΔTIB,c (dB) |
| --- | --- | --- |
| DC\_2-28\_n7 | 2 | 0.5 |
| 28 | 0.3 |
| n7 | 0.5 |

Table 5.86.3-2: ΔRIB

| Inter-band DC configuration | E-UTRA or NR Band | ΔRIB,c (dB) |
| --- | --- | --- |
| DC\_2-28\_n7 | 2 | 0 |
| 28 | 0 |
| n7 | 0 |

5.86.4 Reference sensitivity exceptions

No further REFSENS exceptions needed.

## 5.87 DC\_28-66\_n7

5.87.1 Configurations for DC

Table 5.87.1-1: Inter-band DC configurations (three bands)

| DC  Configuration | Uplink DC  configuration |
| --- | --- |
| DC\_28A-66A\_n7A | DC\_28A\_n7A DC\_66A\_n7A |
|  | |

### 5.87.2 Co-existence studies

Co-existence studies have been performed for lower order combinations of DC\_28A\_n7A and DC\_66A\_n7A, where:

- No IMD product caused by DC\_28A\_n7A fall into own Rx of band 66.

- 2nd IMD product caused by DC\_66A\_n7A may fall into own Rx of band 28.

5.87.3 ∆TIB and ∆RIB values

Values are reused from CA including same bands as given in 36.101.

Table 5.87.3-1: ΔTIB,c

| Inter-band DC configuration | E-UTRA or NR Band | ΔTIB,c (dB) |
| --- | --- | --- |
| DC\_28-66\_n7 | 28 | 0.6 |
| 66 | 0.5 |
| n7 | 0.5 |

Table 5.87.3-2: ΔRIB

| Inter-band DC configuration | E-UTRA or NR Band | ΔRIB,c (dB) |
| --- | --- | --- |
| DC\_28-66\_n7 | 28 | 0.2 |
| 66 | 0.5 |
| n7 | 0.5 |

5.87.4 Reference sensitivity exceptions

Based on co-existence analysis it is found that MSD is needed due to 2nd IMD falling into own Rx band of 28. Therefor additional MSD is needed defined in Table 7.3B.2.3.5.2-1 of 38.101-3.

Table 5. x.4-1: 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\_28A-66A\_n7A | 28 | 735 | 5 | 25 | 790 | 27.6 | IMD2 |
| 66 | 1715 | 5 | 25 | 2115 | N/A | N/A |
| n7 | 2505 | 5 | 50 | 2625 | N/A | N/A |
|  | | | | | | | |

## 5.88 DC\_7-28\_n2

5.88.1 Configurations for DC

Table 5.88.1-1: Inter-band DC configurations (three bands)

| DC  Configuration | Uplink DC  configuration |
| --- | --- |
| DC\_7A-28A\_n2A | DC\_7A\_n2A DC\_28A\_n2A |
|  | |

### 5.88.2 Co-existence studies

Co-existence studies have been performed for lower order combinations. of DC\_7A\_n2A and DC\_28A\_n2A, where:

- No IMD product caused by DC\_7A\_n2A fall into own Rx of band 28.

- IMD2 product caused by DC\_28A\_n2A may fall into own Rx of band 7.

5.88.3 ∆TIB and ∆RIB values

Table 5.88.3-1: ΔTIB,c

| Inter-band DC configuration | E-UTRA or NR Band | ΔTIB,c (dB) |
| --- | --- | --- |
| DC\_7-28\_n2 | 7 | 0.5 |
| 28 | 0.3 |
| n2 | 0.5 |

Table 5.88.3-2: ΔRIB

| Inter-band DC configuration | E-UTRA or NR Band | ΔRIB,c (dB) |
| --- | --- | --- |
| DC\_7-28\_n2 | 7 | 0 |
| 28 | 0 |
| n2 | 0 |

5.88.4 Reference sensitivity exceptions

Based on co-existence studies additional MSD is needed defined in Table 7.3B.2.3.5.2-1 of 38.101-3.

Table 5. x.4-1: 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\_7A-28A\_n2A | 7 | 2510 | 10 | 50 | 2630 | 27.6 | IMD2 |
| 28 | 730 | 5 | 25 | 785 | N/A | N/A |
| n2 | 1900 | 5 | 25 | 1980 | N/A | N/A |
|  | | | | | | | |

## 5.89 DC\_2-7\_n7

5.89.1 Configurations for DC

Table 5.89.1-1: Inter-band DC configurations (three bands)

| DC  Configuration | Uplink DC  configuration |
| --- | --- |
| DC\_2A-7A\_n7A | DC\_2A\_n7A DC\_7A\_n7A2 |
| NOTE 2: Only single switched UL is supported | |

### 5.89.2 Co-existence studies

Co-existence studies have been performed for lower order combinations. No further analysis is needed.

5.89.3 ∆TIB and ∆RIB values

Table 5.89.3-1: ΔTIB,c

| Inter-band DC configuration | E-UTRA or NR Band | ΔTIB,c (dB) |
| --- | --- | --- |
| DC\_2-7\_n7 | 2 | 0.5 |
| 7 | 0.5 |
| n7 | 0.5 |

Table 5.89.3-2: ΔRIB

| Inter-band DC configuration | E-UTRA or NR Band | ΔRIB,c (dB) |
| --- | --- | --- |
| DC\_2-7\_n7 | 2 | 0 |
| 7 | 0 |
| n7 | 0 |

5.89.4 Reference sensitivity exceptions

No further REFSENS exceptions needed.

## 5.90 DC\_2A-71A\_n71A

5.90.1 Configurations for DC

Table 5.90.1-1: Inter-band EN-DC configurations (three bands)

| DC  Configuration | Uplink DC  configuration |
| --- | --- |
| DC\_2A-71A\_n71A | DC\_2A\_n71A |

Note that DC\_71\_n71 is not used as uplink configuration.

### 5.90.2 Co-existence studies

Co-existence studies have been performed for lower order combinations. No further analysis is needed.

5.90.3 ∆TIB and ∆RIB values

Table 5.90.3-1: ΔTIB,c

| Inter-band DC configuration | E-UTRA or NR Band | ΔTIB,c (dB) |
| --- | --- | --- |
| DC\_2-71\_n71 | 2 | 0.3 |
| 71 | 0.3 |
| n71 |

Table 5.90.3-2: ΔRIB

| Inter-band DC configuration | E-UTRA or NR Band | ΔRIB,c (dB) |
| --- | --- | --- |
| DC\_2-71\_n71 | 2 | 0 |
| 71 | 0 |
| n71 |

5.90.4 Reference sensitivity exceptions

REFSENS exceptions for DC\_2A-71A\_n71A due to band 71 uplink harmonic into band 2 is already specified in Table 7.3B.2.3.1-1 of TS 38.101-3.

Wgap exception have been defined for DC\_71A\_n71A, no further MSD is needed.

## 5.91 DC\_66A-71A\_n71A

5.91.1 Configurations for DC

Table 5.91.1-1: Inter-band DC configurations (three bands)

| DC  Configuration | Uplink DC  configuration |
| --- | --- |
| DC\_66A-71A\_n71A | DC\_66A\_n71A |

Note that DC\_71\_n71 is not used as uplink configuration.

### 5.91.2 Co-existence studies

Co-existence studies have been performed for lower order combinations. No further analysis is needed.

5.91.3 ∆TIB and ∆RIB values

Table 5.91.3-1: ΔTIB,c

| Inter-band DC configuration | E-UTRA or NR Band | ΔTIB,c (dB) |
| --- | --- | --- |
| DC\_66-71\_n71 | 66 | 0.3 |
| 71 | 0.3 |
| n71 |

Table 5.91.3-2: ΔRIB

| Inter-band DC configuration | E-UTRA or NR Band | ΔRIB,c (dB) |
| --- | --- | --- |
| DC\_66-71\_n71 | 66 | 0 |
| 71 | 0 |
| n71 |

5.91.4 Reference sensitivity exceptions

Wgap exception have been defined for DC\_71A\_n71A, no further MSD is needed.

## 5.92 DC\_7-66\_n7/ DC\_7-66-66\_n7

5.92.1 Configurations for DC

Table 5.92.1-1: Inter-band DC configurations (three bands)

| DC  configuration | Uplink configuration |
| --- | --- |
| DC\_7A-66A\_n7A  DC\_7A-66A-66A\_n7A | DC\_7A\_n7A2  DC\_66A\_n7A |
| NOTE 2: Only single switched UL is supported | |

5.92.2 Co-existence studies

For UE coexistence study of Band 66 + Band n7, the 2nd, 3rd, 4th and 5th order harmonics and 2nd, 3rd, 4th and 5th order intermodulation products were calculated and presented in Table 5.46.3-1.

Table 5.92.2-1: Harmonic and IMD analysis

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **UE UL carriers** | **fx\_low** | **fx\_high** | **fy\_low** | **fy\_high** |
| UL frequency (MHz) | 2500 | 2570 | 1710 | 1780 |
| 2nd harmonics frequency limits | 2\*fx\_low | 2\*fx\_high | 2\* fy\_low | 2\* fy\_high |
| 2nd harmonics frequency limits (MHz) | 5000 | 5140 | 3420 | 3560 |
| 3rd harmonics frequency limits | 3\*fx\_low | 3\*fx\_high | 3\* fy\_low | 3\* fy\_high |
| 3rd harmonics frequency limits (MHz) | 7500 | 7710 | 5130 | 5340 |
| 4th harmonics frequency limits | 4\*fx\_low | 4\*fx\_high | 4\* fy\_low | 4\* fy\_high |
| 4th harmonics frequency limits (MHz) | 10000 | 10280 | 6840 | 7120 |
| 5th harmonics frequency limits | 5\*fx\_low | 5\*fx\_high | 5\* fy\_low | 5\* fy\_high |
| 5th harmonics frequency limits (MHz) | 12500 | 12850 | 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) | 860 | 720 | 4210 | 4350 |
| 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) | 3220 | 3430 | 850 | 1060 |
| 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) | 6710 | 6920 | 5920 | 6130 |
| 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) | 5720 | 6000 | 2560 | 2840 |
| 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) | 9210 | 9490 | 7630 | 7910 |
| 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 | 1720 | 8420 | 8700 |
| 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) | 4620 | 4270 | 8570 | 8220 |
| 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) | 340 | 10 | 4290 | 3940 |
| 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) | 9340 | 9690 | 11710 | 12060 |
| 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) | 10130 | 10480 | 10920 | 11270 |

For UL DC\_7A\_n7A, there is no need to study the IMD since only single switched UL is supported.

IMD4 may fall into Rx of band 7 with UL DC\_66\_n7.

5.92.3 ∆TIB and ∆RIB values

For DC\_7-66\_n7 and DC\_7-66-66\_n7, the ΔTIB,c and ΔRIB,c values are reused from the LTE combination DC\_66\_n7, and are given in the tables below.

Table 5.92.3-1: ΔTIB,c

| Inter-band DC Configuration | E-UTRA and NR Band | ΔTIB,c [dB] |
| --- | --- | --- |
| DC\_7-66\_n7  DC\_7-66-66\_n7 | 7 | 0.5 |
| 66 | 0.5 |
| n7 | 0.5 |

**Table 5.92.3-2: ΔRIB**

| Inter-band DC Configuration | E-UTRA and NR Band | ΔRIB [dB] |
| --- | --- | --- |
| DC\_7-66\_n7  DC\_7-66-66\_n7 | 7 | 0.5 |
| 66 | 0.5 |
| n7 | 0.5 |

5.92.4 Reference sensitivity exceptions

The reference sensitivity exception (MSD) due to IMD4 for DC\_7-66\_n7/ DC\_7-66-66\_n7 with UL DC\_66\_n7 is specified as below referring to the MSD for DC\_66A\_n7A from 38.101-3.

Table 5.92.x.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\_7A-66A\_n7A  DC\_7A-66A-66A\_n7A | 7 | 2555 | 10 | 50 | 2675 | 15 | IMD4 |
| 66 | 1730 | 5 | 25 | 2130 | N/A | N/A |
| n7 | 2515 | 10 | 50 | 2635 | N/A | N/A |
|  | | | | | | | |

## 5.93 DC\_2-7\_n77

### 5.93.1 Configurations for DC

Table 5.93.1-1: Inter-band DC configurations (three bands)

| DC  configuration | Uplink configuration |
| --- | --- |
| DC\_2A-7A\_n77A  DC\_2A-7C\_n77A  DC\_2A-7A-7A\_n77A  DC\_2A-7A\_n77(2A)  DC\_2A-7C\_n77(2A)  DC\_2A-7A-7A\_n77(2A) | DC\_2A\_n77A  DC\_7A\_n77A |

### 5.93.2 Co-existence studies

For UE coexistence study of Band 2 + Band n77, the 2nd, 3rd, 4th and 5th order harmonics and 2nd, 3rd, 4th and 5th order intermodulation products were calculated and presented in Table 5.93.2-1.

**Table 5.93.2-1: Harmonic and IMD analysis**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **UE UL carriers** | **fx\_low** | **fx\_high** | **fy\_low** | **fy\_high** |
| UL frequency (MHz) | 3300 | 4200 | 1850 | 1910 |
| 2nd harmonics frequency limits | 2\*fx\_low | 2\*fx\_high | 2\* fy\_low | 2\* fy\_high |
| 2nd harmonics frequency limits (MHz) | 6600 | 8400 | 3700 | 3820 |
| 3rd harmonics frequency limits | 3\*fx\_low | 3\*fx\_high | 3\* fy\_low | 3\* fy\_high |
| 3rd harmonics frequency limits (MHz) | 9900 | 12600 | 5550 | 5730 |
| 4th harmonics frequency limits | 4\*fx\_low | 4\*fx\_high | 4\* fy\_low | 4\* fy\_high |
| 4th harmonics frequency limits (MHz) | 13200 | 16800 | 7400 | 7640 |
| 5th harmonics frequency limits | 5\*fx\_low | 5\*fx\_high | 5\* fy\_low | 5\* fy\_high |
| 5th harmonics frequency limits (MHz) | 16500 | 21000 | 9250 | 9550 |
| Two tone 2nd order IMD products | fy\_low – fx\_high | fy\_high – fx\_low | fx\_low + fy\_low | fx\_high + fy\_high |
| IMD frequency limits (MHz) | 2350 | 1390 | 5150 | 6110 |
| 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) | 4690 | 6550 | 500 | 520 |
| 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) | 8450 | 10310 | 7000 | 8020 |
| 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) | 7990 | 10750 | 1350 | 2430 |
| 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) | 11750 | 14510 | 8850 | 9030 |
| Two-tone 4th order IMD products | 2\*fy\_low – 2\*fx\_high | 2\*fy\_high – 2\*fx\_low | 2\*fx\_low + 2\*fy\_low | 2\*fx\_high + 2\*fy\_high |
| IMD frequency limits (MHz) | 4700 | 2780 | 10300 | 12220 |
| Two-tone 5th order IMD products | |4\*fx\_low – fy\_high| | |4\*fx\_high – fy\_low| | 4\*fy\_low – fx\_high | 4\*fy\_high – fx\_low |
| IMD frequency limits (MHz) | 11290 | 14950 | 3200 | 4340 |
| Two-tone 5th order IMD products | 4\*fx\_low + fy\_low | 4\*fx\_high + fy\_high | 4\*fy\_low + fx\_low | 4\*fy\_high + fx\_high |
| IMD frequency limits (MHz) | 15050 | 18710 | 10700 | 11840 |
| Two-tone 5th order IMD products | |3\*fx\_low – 2\*fy\_high| | |3\*fx\_high – 2\*fy\_low| | 3\*fy\_low – 2\*fx\_high | 3\*fy\_high – 2\*fx\_low |
| IMD frequency limits (MHz) | 6080 | 8900 | 2850 | 870 |
| 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) | 12150 | 14130 | 13600 | 16420 |

For UE coexistence study of Band 7 + Band n77, the 2nd, 3rd, 4th and 5th order harmonics and 2nd, 3rd, 4th and 5th order intermodulation products were calculated and presented in Table 5.93.2-2

**Table 5.93.2-2: Harmonic and IMD analysis**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **UE UL carriers** | **fx\_low** | **fx\_high** | **fy\_low** | **fy\_high** |
| UL frequency (MHz) | 3300 | 4200 | 2500 | 2570 |
| 2nd harmonics frequency limits | 2\*fx\_low | 2\*fx\_high | 2\* fy\_low | 2\* fy\_high |
| 2nd harmonics frequency limits (MHz) | 6600 | 8400 | 5000 | 5140 |
| 3rd harmonics frequency limits | 3\*fx\_low | 3\*fx\_high | 3\* fy\_low | 3\* fy\_high |
| 3rd harmonics frequency limits (MHz) | 9900 | 12600 | 7500 | 7710 |
| 4th harmonics frequency limits | 4\*fx\_low | 4\*fx\_high | 4\* fy\_low | 4\* fy\_high |
| 4th harmonics frequency limits (MHz) | 13200 | 16800 | 10000 | 10280 |
| 5th harmonics frequency limits | 5\*fx\_low | 5\*fx\_high | 5\* fy\_low | 5\* fy\_high |
| 5th harmonics frequency limits (MHz) | 16500 | 21000 | 12500 | 12850 |
| Two tone 2nd order IMD products | fy\_low – fx\_high | fy\_high – fx\_low | fx\_low + fy\_low | fx\_high + fy\_high |
| IMD frequency limits (MHz) | 1700 | 730 | 5800 | 6770 |
| 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) | 4030 | 5900 | 800 | 1840 |
| 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) | 9100 | 10970 | 8300 | 9340 |
| 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) | 7330 | 10100 | 3300 | 4410 |
| 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) | 12400 | 15170 | 10800 | 11010 |
| Two-tone 4th order IMD products | 2\*fy\_low – 2\*fx\_high | 2\*fy\_high – 2\*fx\_low | 2\*fx\_low + 2\*fy\_low | 2\*fx\_high + 2\*fy\_high |
| IMD frequency limits (MHz) | 3400 | 1460 | 11600 | 13540 |
| Two-tone 5th order IMD products | |4\*fx\_low – fy\_high| | |4\*fx\_high – fy\_low| | 4\*fy\_low – fx\_high | 4\*fy\_high – fx\_low |
| IMD frequency limits (MHz) | 10630 | 14300 | 5800 | 6980 |
| Two-tone 5th order IMD products | 4\*fx\_low + fy\_low | 4\*fx\_high + fy\_high | 4\*fy\_low + fx\_low | 4\*fy\_high + fx\_high |
| IMD frequency limits (MHz) | 15700 | 19370 | 13300 | 14480 |
| Two-tone 5th order IMD products | |3\*fx\_low – 2\*fy\_high| | |3\*fx\_high – 2\*fy\_low| | 3\*fy\_low – 2\*fx\_high | 3\*fy\_high – 2\*fx\_low |
| IMD frequency limits (MHz) | 4760 | 7600 | 900 | 1110 |
| 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) | 14100 | 16110 | 14900 | 17740 |

Based on co-existence study as presented in the table 5.93.2-1 and 5.93.2-2, own Rx impact of the 3rd band is shown as the followings.

* 4th order IMD generated by dual uplink of Band 7 + Band n77 may also fall into own Rx of band 2
* 5th order IMD generated by dual uplink of Band 2 + Band n77 may also fall into own Rx of band 7

### 5.93.3 ∆TIB and ∆RIB values

Table 5.93.3-1: ΔTIB,c

| Inter-band DC Configuration | E-UTRA and NR Band | ΔTIB,c [dB] |
| --- | --- | --- |
| DC\_2-7\_n77  DC\_2-7-7\_n77 | 2 | 0.6 |
| 7 | 0.5 |
| n77 | 0.8 |

**Table 5.93.3-2: ΔRIB**

| Inter-band DC Configuration | E-UTRA and NR Band | ΔRIB [dB] |
| --- | --- | --- |
| DC\_2-7\_n77  DC\_2-7-7\_n77 | 2 | 0.2 |
| 7 | 0.5 |
| n77 | 0.5 |

### 5.93.4 Reference sensitivity exceptions

The MSD requirement due to 4th order IMD for DC\_2-7\_n78 can be reused for DC\_2-7\_n77.

By adjusting the centre frequency of uplink of Band 2 + Band n77, the MSD requirement due to 5th order IMD for DC\_2-7\_n77 can be similar as the requirements of DC\_3-7\_n77 since the source of IMD is the same.

Table 5.93.4-1 lists the MSD required for DC\_2-7\_n77.

**Table 5.93.4-1: MSD for the DC configuration due to IMD issue (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\_n77A  DC\_2A-7C\_n77A  DC\_2A-7A-7A\_n77A  DC\_2A-7A\_n77(2A)  DC\_2A-7C\_n77(2A)  DC\_2A-7A-7A\_n77(2A) | 2 | 1870 | 5 | 25 | 1950 | 8.6 | IMD4 |
| 7 | 2550 | 5 | 25 | 2685 | N/A | N/A |
| n77 | 3525 | 10 | 50 | 3475 | N/A | N/A |
| 2 | 1860 | 5 | 25 | 1940 | N/A | N/A |
| 7 | 2540 | 5 | 25 | 2660 | 3.4 | IMD5 |
| n77 | 4120 | 10 | 50 | 4120 | N/A | N/A |

## 5.94 Void























## 5.95 DC\_20-40\_n78

5.95.1 Operating bands for DC

Table 5.95.1-1: Band combinations EN-DC (three bands)

| EN-DC Band | E-UTRA Band | NR Band | Single UL allowed |
| --- | --- | --- | --- |
| DC\_20-40\_n78 | CA\_20-40 | n78 | No |

5.95.2 Configurations for DC

Table 5.95.2-1: Inter-band EN-DC configurations (three bands)

| EN-DC  configuration | Uplink EN-DC  configuration  (NOTE 1) | E-UTRA configuration | NR configuration |
| --- | --- | --- | --- |
| DC\_20A-40A\_n78A | DC\_20A\_n78A  DC\_40A\_n78A | CA\_20A-40A | n78 |

5.95.3 Co-existence studies

Based on co-existence studies of Band 20 + Band n78 captured in 37.863-01-01 there is no IMD interfering band 40

And based on co-existence studies of Band 40 + Band n78 captured in 37.716-11-11, MSD shall be considered since

- 3rd order IMD generated by dual uplink of the two bands may fall into own Rx of band 20.

5.95.4 ∆TIB and ∆RIB values

It is proposed to re-use relaxation values from DC\_8-40-n78 which is very similar.

Table 5.95.4-1: ΔTIB,c

| Inter-band DC Configuration | E-UTRA and NR Band | ΔTIB,c [dB] |
| --- | --- | --- |
| DC\_20-40-n78 | 20 | 0.6 |
| 40 | 0.35 |
| n78 | 0.85 |
| NOTE 5: Only applicable for UE supporting inter-band carrier aggregation with uplink in one E-UTRA band and without simultaneous Rx/Tx. | | |

**Table 5.95.4-2: ΔRIB**

| Inter-band DC Configuration | E-UTRA and NR Band | ΔRIB [dB] |
| --- | --- | --- |
| DC\_20-40-n78 | 20 | 0.2 |
| 40 | 0.45 |
| n78 | 0.55 |
| NOTE 5: Only applicable for UE supporting inter-band carrier aggregation with uplink in one E-UTRA band and without simultaneous Rx/Tx. | | |

5.95.5 REFSENS requirements

It is proposed to re-use IMD3 MSD value from DC\_8-40-n78 which is very similar.

Table 5.95.5-1: 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\_20A-40A\_n78A | 20 | 856 | 5 | 25 | 815 | 19.8 | IMD3 |
| 40 | 2302.5 | 5 | 25 | 2302.5 | N/A | N/A |
| n78 | 3790 | 10 | 50 | 3790 | N/A | N/A |

## 5.96 DC\_3-18\_n41

### 5.96.1 Configurations for DC

Table 5.96.1-1: Inter-band DC configurations (three bands)

| DC  configuration | Uplink configuration |
| --- | --- |
| DC\_3A-18A\_n41A | DC\_3A\_n41A  DC\_18A\_n41A |

### 5.96.2 Co-existence studies

Co-existence studies of this 3DL/2UL DC configuration are already covered in the constituent fall-back modes. And it can be get:

- IMD2 of band 18 UL and band n41 UL falling to band 3 DL.

- IMD2 and IMD3 of band 3 UL and band n41 UL falling to band 18 DL.

### 5.96.3 ∆TIB and ∆RIB values

For DC\_3-18\_n41, the ΔTIB,c and ΔRIB,c values are given in the tables below.

Table 5.96.3-1: ΔTIB,c

| Inter-band DC Configuration | E-UTRA and NR Band | ΔTIB,c [dB] |
| --- | --- | --- |
| DC\_3-18\_n41 | 3 | 0.6 |
| 18 | 0.3 |
| n41 | 0.31 |
| 0.82 |
| NOTE 1: Applicable for the frequency range of 2515-2690 MHz.  NOTE 2 Applicable for the frequency range of 2496-2515 MHz. | | |

**Table 5.96.3-2: ΔRIB**

| Inter-band DC Configuration | E-UTRA and NR Band | ΔRIB [dB] |
| --- | --- | --- |
| DC\_3-18\_n41 | 3 | 0 |
| 18 | 0 |
| n41 | 01 |
| 0.52 |
| NOTE 1: Applicable for the frequency range of 2515-2690 MHz.  NOTE 2 Applicable for the frequency range of 2496-2515 MHz. | | |

### 5.96.4 Reference sensitivity exceptions

Table 5.96.4-1 shows the required MSD:

Table 5.96.4-1: 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)** | **IMD order** |
| DC\_3-18\_n41 | 18 | 820 | 5 | 25 | 865 | 28.9 | IMD2 |
| 3 | 1765 | 5 | 25 | 1860 | N/A | N/A |
| n41 | 2630 | 10 | 50 | 2630 | N/A | N/A |
| 18 | 820 | 5 | 25 | 865 | 19.0 | IMD3 |
| 3 | 1725 | 5 | 25 | 1820 | N/A | N/A |
| n41 | 2585 | 5 | 25 | 2585 | N/A | N/A |
| 3 | 1755 | 5 | 25 | 1850 | 28.8 | IMD2 |
| n41 | 2670 | 10 | 50 | 2670 | N/A | N/A |
| 18 | 820 | 5 | 25 | 865 | MSD | N/A |

## 5.97 DC\_7-25\_n77

5.97.1 Operating bands for DC

Table 5.97.1-1: Inter-band DC configurations (three bands)

| DC  configuration | Uplink configuration |
| --- | --- |
| DC\_7A-25A\_n77A  DC\_7A-7A-25A\_n77A  DC\_7C-25A\_n77A  DC\_7C-25A-25A\_n77A  DC\_7A-25A-25A\_n77A  DC\_7A-7A-25A-25A\_n77A | DC\_7A\_n77A  DC\_25A\_n77A |

### 5.97.2 Co-existence studies

For UE coexistence study of Band 7 + Band n77, the 2nd, 3rd, 4th and 5th order harmonics and 2nd, 3rd, 4th and 5th order intermodulation products were calculated and presented in Table 5.97.2-1.

**Table 5.97.2-1: Harmonic and IMD analysis for DC\_7\_n77**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| UE UL carriers | f1\_low | f1\_high | f2\_low | f2\_high |
| UL frequencies (MHz) | 2500 | 2570 | 3300 | 4200 |
| 2nd harmonic | 2\* f1\_low | 2\*f1\_high | 2\*f2\_low | 2\*f2\_high |
| harmonic frequency limit (MHz) | 5000 | 5140 | 6600 | 8400 |
| 3rd harmonic | 3\* f1\_low | 3\*f1\_high | 3\*f2\_low | 3\*f2\_high |
| harmonic frequency limit (MHz) | 7500 | 7710 | 9900 | 12600 |
| 2nd order IMD products | f2\_low – f1\_high | f2\_high – f1\_low | f2\_low + f1\_low | f2\_high + f1\_high |
| IMD frequency limit (MHz) | 730 | 1700 | 5800 | 6770 |
| 3rd order IMD products | 2\*f1\_low – f2\_high | 2\*f1\_high – f2\_low | 2\*f2\_low – f1\_high | 2\*f2\_high – f1\_low |
| IMD frequency limit (MHz) | 800 | 1840 | 4030 | 5900 |
| 3rd order IMD products | 2\*f1\_low + f2\_low | 2\*f1\_high + f2\_high | 2\*f2\_low + f1\_low | 2\*f2\_high + f1\_high |
| IMD frequency limit (MHz) | 8300 | 9340 | 9100 | 10970 |
| 4th order IMD products | 3\*f1\_low – f2\_high | 3\*f1\_high – f2\_low | 3\*f2\_low – f1\_high | 3\*f2\_high – f1\_low |
| IMD frequency limit (MHz) | 3300 | 4410 | 7330 | 10100 |
| 4th order IMD products | 3\*f1\_low + f2\_low | 3\*f1\_high + f2\_high | 3\*f2\_low + f1\_low | 3\*f2\_high + f1\_high |
| IMD frequency limit (MHz) | 10800 | 11910 | 12400 | 15170 |
| 4th order IMD products | 2\*f1\_low – 2\*f2\_high | 2\*f1\_high – 2\*f2\_low | 2\*f1\_low + 2\*f2\_low | 2\*f1\_high + 2\*f2\_high |
| IMD frequency limit (MHz) | 3400 | 1460 | 11600 | 13540 |
| 5th order IMD products | f1\_low – 4\*f2\_high | f1\_high – 4\*f2\_low | f2\_low – 4\*f1\_high | f2\_high – 4\*f1\_low |
| IMD frequency limit (MHz) | 14300 | 10630 | 6980 | 5800 |
| 5th order IMD products | f1\_low + 4\*f2\_low | f1\_high + 4\*f2\_high | f2\_low + 4\*f1\_low | f2\_high + 4\*f1\_high |
| IMD frequency limit (MHz) | 15700 | 19370 | 13300 | 14480 |
| 5th order IMD products | 2\*f1\_low – 3\*f2\_high | 2\*f1\_high - 3\*f2\_low | 2\*f2\_low – 3\*f1\_high | 2\*f2\_high – 3\*f1\_low |
| IMD frequency limit (MHz) | 7600 | 4760 | 1110 | 900 |
| 5th order IMD products | 2\*f1\_low + 3\*f2\_low | 2\*f1\_high + 3\*f2\_high | 2\*f2\_low + 3\*f1\_low | 2\*f2\_high + 3\*f1\_high |
| IMD frequency limit (MHz) | 14900 | 17740 | 14100 | 16110 |

For UE coexistence study of Band 25 + Band n77, the 2nd, 3rd, 4th and 5th order harmonics and 2nd, 3rd, 4th and 5th order intermodulation products were calculated and presented in Table 5.97.2-2.

**Table 5.97.2-2: Harmonic and IMD analysis for DC\_25\_n77**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| UE UL carriers | f1\_low | f1\_high | f2\_low | f2\_high |
| UL frequencies (MHz) | 1850 | 1915 | 3300 | 4200 |
| 2nd harmonic | 2\* f1\_low | 2\*f1\_high | 2\*f2\_low | 2\*f2\_high |
| harmonic frequency limit (MHz) | 3700 | 3830 | 6600 | 8400 |
| 3rd harmonic | 3\* f1\_low | 3\*f1\_high | 3\*f2\_low | 3\*f2\_high |
| harmonic frequency limit (MHz) | 5550 | 5745 | 9900 | 12600 |
| 2nd order IMD products | f2\_low – f1\_high | f2\_high – f1\_low | f2\_low + f1\_low | f2\_high + f1\_high |
| IMD frequency limit (MHz) | 1385 | 2350 | 5150 | 6115 |
| 3rd order IMD products | 2\*f1\_low – f2\_high | 2\*f1\_high – f2\_low | 2\*f2\_low – f1\_high | 2\*f2\_high – f1\_low |
| IMD frequency limit (MHz) | 500 | 530 | 4685 | 6550 |
| 3rd order IMD products | 2\*f1\_low + f2\_low | 2\*f1\_high + f2\_high | 2\*f2\_low + f1\_low | 2\*f2\_high + f1\_high |
| IMD frequency limit (MHz) | 7000 | 8030 | 8450 | 10315 |
| 4th order IMD products | 3\*f1\_low – f2\_high | 3\*f1\_high – f2\_low | 3\*f2\_low – f1\_high | 3\*f2\_high – f1\_low |
| IMD frequency limit (MHz) | 1350 | 2445 | 7985 | 10750 |
| 4th order IMD products | 3\*f1\_low + f2\_low | 3\*f1\_high + f2\_high | 3\*f2\_low + f1\_low | 3\*f2\_high + f1\_high |
| IMD frequency limit (MHz) | 8850 | 9945 | 11750 | 14515 |
| 4th order IMD products | 2\*f1\_low – 2\*f2\_high | 2\*f1\_high – 2\*f2\_low | 2\*f1\_low + 2\*f2\_low | 2\*f1\_high + 2\*f2\_high |
| IMD frequency limit (MHz) | 4700 | 2770 | 10300 | 12230 |
| 5th order IMD products | f1\_low – 4\*f2\_high | f1\_high – 4\*f2\_low | f2\_low – 4\*f1\_high | f2\_high – 4\*f1\_low |
| IMD frequency limit (MHz) | 14950 | 11285 | 4360 | 3200 |
| 5th order IMD products | f1\_low + 4\*f2\_low | f1\_high + 4\*f2\_high | f2\_low + 4\*f1\_low | f2\_high + 4\*f1\_high |
| IMD frequency limit (MHz) | 15050 | 18715 | 10700 | 11860 |
| 5th order IMD products | 2\*f1\_low – 3\*f2\_high | 2\*f1\_high - 3\*f2\_low | 2\*f2\_low – 3\*f1\_high | 2\*f2\_high – 3\*f1\_low |
| IMD frequency limit (MHz) | 8900 | 6070 | 855 | 2850 |
| 5th order IMD products | 2\*f1\_low + 3\*f2\_low | 2\*f1\_high + 3\*f2\_high | 2\*f2\_low + 3\*f1\_low | 2\*f2\_high + 3\*f1\_high |
| IMD frequency limit (MHz) | 13600 | 16430 | 12150 | 14145 |

Based on co-existence study as presented in the table 5.97.2-1 and 5.97.2-2, own Rx impact is shown in the following.

* The 4th order IMD generated by dual uplink of Band 7 + Band n77 may fall into own Rx of band 25 and n77
* The 2nd harmonic of Band 25 uplink may fall into own Rx of band n77
* The 2nd, 4th and 5th order IMD generated by dual uplink of Band 25 + Band n77 may fall into own Rx of band 25
* The 5th order IMD generated by dual uplink of Band 25 + Band n77 may fall into own Rx of band 7
* The 4th and 5th order IMD generated by dual uplink of Band 25 + Band n77 may fall into own Rx of Band n77

### 5.97.3 ∆TIB and ∆RIB values

The same relaxation values as DC\_2-7\_n77 is used.

Table 5.97.3-1: ΔTIB,c

| Inter-band DC Configuration | E-UTRA and NR Band | ΔTIB,c [dB] |
| --- | --- | --- |
| DC\_7-25\_n77  DC\_7-7-25\_n77  DC\_7-25-25\_n77  DC\_7-7-25-25\_n77 | 7 | 0.5 |
| 25 | 0.6 |
| n77 | 0.8 |

**Table 5.97.3-2: ΔRIB**

| Inter-band DC Configuration | E-UTRA and NR Band | ΔRIB [dB] |
| --- | --- | --- |
| DC\_7-25\_n77  DC\_7-7-25\_n77  DC\_7-25-25\_n77  DC\_7-7-25-25\_n77 | 7 | 0.5 |
| 25 | 0.2 |
| n77 | 0.5 |

### 5.97.4 Reference sensitivity exceptions

The IMD issues specifc to 3DL/2UL is the 4th order IMD for 25+n77 falling into band 25 and the 5th order IMD falling into band 7. This issue is similar to DC\_2-7\_n77 and the same MSD is used.

**Table 5.97.4-1: MSD for the DC configuration due to IMD issue (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-25A\_n77A  DC\_7A-7A-25A\_n77A  DC\_7C-25A\_n77A  DC\_7C-25A-25A\_n77A  DC\_7A-25A-25A\_n77A  DC\_7A-7A-25A-25A\_n77A | 7 | 2550 | 5 | 25 | 2670 | N/A | N/A |
| 25 | 1870 | 5 | 25 | 1950 | 8.6 | IMD4 |
| n77 | 3525 | 10 | 50 | 3525 | N/A | N/A |
| 7 | 2540 | 5 | 25 | 2660 | 3.4 | IMD5 |
| 25 | 1860 | 5 | 25 | 1940 | N/A | N/A |
| n77 | 4120 | 10 | 50 | 4120 | N/A | N/A |

## 5.98 DC\_7-25\_n78

5.98.1 Operating bands for DC

Table 5.98.1-1: Inter-band DC configurations (three bands)

| DC  configuration | Uplink configuration |
| --- | --- |
| DC\_7A-25A\_n78A  DC\_7A-7A-25A\_n78A  DC\_7C-25A\_n78A  DC\_7A-25A-25A\_n78A  DC\_7A-7A-25A-25A\_n78A  DC\_7C-25A-25A\_n78A | DC\_7A\_n78A  DC\_25A\_n78A |

### 5.98.2 Co-existence studies

For UE coexistence study of Band 7 + Band n78, the 2nd, 3rd, 4th and 5th order harmonics and 2nd, 3rd, 4th and 5th order intermodulation products were calculated and presented in Table 5.98.2-1.

**Table 5.98.2-1: Harmonic and IMD analysis for DC\_7\_n78**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| UE UL carriers | f1\_low | f1\_high | f2\_low | f2\_high |
| UL frequencies (MHz) | 2500 | 2570 | 3300 | 3800 |
| 2nd harmonic | 2\* f1\_low | 2\*f1\_high | 2\*f2\_low | 2\*f2\_high |
| harmonic frequency limit (MHz) | 5000 | 5140 | 6600 | 7600 |
| 3rd harmonic | 3\* f1\_low | 3\*f1\_high | 3\*f2\_low | 3\*f2\_high |
| harmonic frequency limit (MHz) | 7500 | 7710 | 9900 | 11400 |
| 2nd order IMD products | f2\_low – f1\_high | f2\_high – f1\_low | f2\_low + f1\_low | f2\_high + f1\_high |
| IMD frequency limit (MHz) | 730 | 1300 | 5800 | 6370 |
| 3rd order IMD products | 2\*f1\_low – f2\_high | 2\*f1\_high – f2\_low | 2\*f2\_low – f1\_high | 2\*f2\_high – f1\_low |
| IMD frequency limit (MHz) | 1200 | 1840 | 4030 | 5100 |
| 3rd order IMD products | 2\*f1\_low + f2\_low | 2\*f1\_high + f2\_high | 2\*f2\_low + f1\_low | 2\*f2\_high + f1\_high |
| IMD frequency limit (MHz) | 8300 | 8940 | 9100 | 10170 |
| 4th order IMD products | 3\*f1\_low – f2\_high | 3\*f1\_high – f2\_low | 3\*f2\_low – f1\_high | 3\*f2\_high – f1\_low |
| IMD frequency limit (MHz) | 3700 | 4410 | 7330 | 8900 |
| 4th order IMD products | 3\*f1\_low + f2\_low | 3\*f1\_high + f2\_high | 3\*f2\_low + f1\_low | 3\*f2\_high + f1\_high |
| IMD frequency limit (MHz) | 10800 | 11510 | 12400 | 13970 |
| 4th order IMD products | 2\*f1\_low – 2\*f2\_high | 2\*f1\_high – 2\*f2\_low | 2\*f1\_low + 2\*f2\_low | 2\*f1\_high + 2\*f2\_high |
| IMD frequency limit (MHz) | 2600 | 1460 | 11600 | 12740 |
| 5th order IMD products | f1\_low – 4\*f2\_high | f1\_high – 4\*f2\_low | f2\_low – 4\*f1\_high | f2\_high – 4\*f1\_low |
| IMD frequency limit (MHz) | 12700 | 10630 | 6980 | 6200 |
| 5th order IMD products | f1\_low + 4\*f2\_low | f1\_high + 4\*f2\_high | f2\_low + 4\*f1\_low | f2\_high + 4\*f1\_high |
| IMD frequency limit (MHz) | 15700 | 17770 | 13300 | 14080 |
| 5th order IMD products | 2\*f1\_low – 3\*f2\_high | 2\*f1\_high - 3\*f2\_low | 2\*f2\_low – 3\*f1\_high | 2\*f2\_high – 3\*f1\_low |
| IMD frequency limit (MHz) | 6400 | 4760 | 1110 | 100 |
| 5th order IMD products | 2\*f1\_low + 3\*f2\_low | 2\*f1\_high + 3\*f2\_high | 2\*f2\_low + 3\*f1\_low | 2\*f2\_high + 3\*f1\_high |
| IMD frequency limit (MHz) | 14900 | 16540 | 14100 | 15310 |

For UE coexistence study of Band 25 + Band n78, the 2nd, 3rd, 4th and 5th order harmonics and 2nd, 3rd, 4th and 5th order intermodulation products were calculated and presented in Table 5.98.2-2.

**Table 5.98.2-2: Harmonic and IMD analysis for DC\_25\_n78**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| UE UL carriers | f1\_low | f1\_high | f2\_low | f2\_high |
| UL frequencies (MHz) | 1850 | 1915 | 3300 | 3800 |
| 2nd harmonic | 2\* f1\_low | 2\*f1\_high | 2\*f2\_low | 2\*f2\_high |
| harmonic frequency limit (MHz) | 3700 | 3830 | 6600 | 7600 |
| 3rd harmonic | 3\* f1\_low | 3\*f1\_high | 3\*f2\_low | 3\*f2\_high |
| harmonic frequency limit (MHz) | 5550 | 5745 | 9900 | 11400 |
| 2nd order IMD products | f2\_low – f1\_high | f2\_high – f1\_low | f2\_low + f1\_low | f2\_high + f1\_high |
| IMD frequency limit (MHz) | 1385 | 1950 | 5150 | 5715 |
| 3rd order IMD products | 2\*f1\_low – f2\_high | 2\*f1\_high – f2\_low | 2\*f2\_low – f1\_high | 2\*f2\_high – f1\_low |
| IMD frequency limit (MHz) | 100 | 530 | 4685 | 5750 |
| 3rd order IMD products | 2\*f1\_low + f2\_low | 2\*f1\_high + f2\_high | 2\*f2\_low + f1\_low | 2\*f2\_high + f1\_high |
| IMD frequency limit (MHz) | 7000 | 7630 | 8450 | 9515 |
| 4th order IMD products | 3\*f1\_low – f2\_high | 3\*f1\_high – f2\_low | 3\*f2\_low – f1\_high | 3\*f2\_high – f1\_low |
| IMD frequency limit (MHz) | 1750 | 2445 | 7985 | 9550 |
| 4th order IMD products | 3\*f1\_low + f2\_low | 3\*f1\_high + f2\_high | 3\*f2\_low + f1\_low | 3\*f2\_high + f1\_high |
| IMD frequency limit (MHz) | 8850 | 9545 | 11750 | 13315 |
| 4th order IMD products | 2\*f1\_low – 2\*f2\_high | 2\*f1\_high – 2\*f2\_low | 2\*f1\_low + 2\*f2\_low | 2\*f1\_high + 2\*f2\_high |
| IMD frequency limit (MHz) | 3900 | 2770 | 10300 | 11430 |
| 5th order IMD products | f1\_low – 4\*f2\_high | f1\_high – 4\*f2\_low | f2\_low – 4\*f1\_high | f2\_high – 4\*f1\_low |
| IMD frequency limit (MHz) | 13350 | 11285 | 4360 | 3600 |
| 5th order IMD products | f1\_low + 4\*f2\_low | f1\_high + 4\*f2\_high | f2\_low + 4\*f1\_low | f2\_high + 4\*f1\_high |
| IMD frequency limit (MHz) | 15050 | 17115 | 10700 | 11460 |
| 5th order IMD products | 2\*f1\_low – 3\*f2\_high | 2\*f1\_high - 3\*f2\_low | 2\*f2\_low – 3\*f1\_high | 2\*f2\_high – 3\*f1\_low |
| IMD frequency limit (MHz) | 7700 | 6070 | 855 | 2050 |
| 5th order IMD products | 2\*f1\_low + 3\*f2\_low | 2\*f1\_high + 3\*f2\_high | 2\*f2\_low + 3\*f1\_low | 2\*f2\_high + 3\*f1\_high |
| IMD frequency limit (MHz) | 13600 | 15230 | 12150 | 13345 |

Based on co-existence study as presented in the table 5.98.2-1 and 5.98.2-2, own Rx impact is shown in the following.

* The 4th order IMD generated by dual uplink of Band 7 + Band n78 may fall into own Rx of band 25 and n78
* The 2nd harmonic of Band 25 uplink may fall into own Rx of band n78
* The 2nd, 4th and 5th order IMD generated by dual uplink of Band 25 + Band n78 may fall into own Rx of band 25
* The 4th order IMD generated by dual uplink of Band 25 + Band n78 may fall into own Rx of Band n78

### 5.98.3 ∆TIB and ∆RIB values

The same relaxation values as DC\_2-7\_n78 is used.

Table 5.98.3-1: ΔTIB,c

| Inter-band DC Configuration | E-UTRA and NR Band | ΔTIB,c [dB] |
| --- | --- | --- |
| DC\_7-25\_n78  DC\_7-7-25\_n78  DC\_7-25-25\_n78  DC\_7-7-25-25\_n78 | 7 | 0.5 |
| 25 | 0.6 |
| n78 | 0.8 |

**Table 5.98.3-2: ΔRIB**

| Inter-band DC Configuration | E-UTRA and NR Band | ΔRIB [dB] |
| --- | --- | --- |
| DC\_7-25\_n78  DC\_7-7-25\_n78  DC\_7-25-25\_n78  DC\_7-7-25-25\_n78 | 7 | 0.5 |
| 25 | 0.2 |
| n78 | 0.5 |

### 5.98.4 Reference sensitivity exceptions

The IMD issue specifc to 3DL/2UL is the 4th order IMD for 25+n78 falling into band 25. This issue is similar to DC\_2-7\_n78 and the same MSD is used.

**Table 5.98.4-1: MSD for the DC configuration due to IMD issue (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-25A\_n78A  DC\_7A-7A-25A\_n78A  DC\_7C-25A\_n78A  DC\_7A-25A-25A\_n78A  DC\_7A-7A-25A-25A\_n78A  DC\_7C-25A-25A\_n78A | 7 | 2550 | 5 | 25 | 2670 | N/A | N/A |
| 25 | 1870 | 5 | 25 | 1950 | 8.6 | IMD4 |
| n78 | 3525 | 10 | 50 | 3525 | N/A | N/A |

## 5.99 DC\_25-66\_n77

5.99.1 Operating bands for DC

Table 5.99.1-1: Inter-band DC configurations (three bands)

| DC  configuration | Uplink configuration |
| --- | --- |
| DC\_25A-66A\_n77A  DC\_25A-25A-66A\_n77A | DC\_25A\_n77A  DC\_66A\_n77A |

### 5.99.2 Co-existence studies

For UE coexistence study of Band 25 + Band n77, the 2nd, 3rd, 4th and 5th order harmonics and 2nd, 3rd, 4th and 5th order intermodulation products were calculated and presented in Table 5.99.2-1.

**Table 5.99.2-1: Harmonic and IMD analysis for DC\_25\_n77**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| UE UL carriers | f1\_low | f1\_high | f2\_low | f2\_high |
| UL frequencies (MHz) | 1850 | 1915 | 3300 | 4200 |
| 2nd harmonic | 2\* f1\_low | 2\*f1\_high | 2\*f2\_low | 2\*f2\_high |
| harmonic frequency limit (MHz) | 3700 | 3830 | 6600 | 8400 |
| 3rd harmonic | 3\* f1\_low | 3\*f1\_high | 3\*f2\_low | 3\*f2\_high |
| harmonic frequency limit (MHz) | 5550 | 5745 | 9900 | 12600 |
| 2nd order IMD products | f2\_low – f1\_high | f2\_high – f1\_low | f2\_low + f1\_low | f2\_high + f1\_high |
| IMD frequency limit (MHz) | 1385 | 2350 | 5150 | 6115 |
| 3rd order IMD products | 2\*f1\_low – f2\_high | 2\*f1\_high – f2\_low | 2\*f2\_low – f1\_high | 2\*f2\_high – f1\_low |
| IMD frequency limit (MHz) | 500 | 530 | 4685 | 6550 |
| 3rd order IMD products | 2\*f1\_low + f2\_low | 2\*f1\_high + f2\_high | 2\*f2\_low + f1\_low | 2\*f2\_high + f1\_high |
| IMD frequency limit (MHz) | 7000 | 8030 | 8450 | 10315 |
| 4th order IMD products | 3\*f1\_low – f2\_high | 3\*f1\_high – f2\_low | 3\*f2\_low – f1\_high | 3\*f2\_high – f1\_low |
| IMD frequency limit (MHz) | 1350 | 2445 | 7985 | 10750 |
| 4th order IMD products | 3\*f1\_low + f2\_low | 3\*f1\_high + f2\_high | 3\*f2\_low + f1\_low | 3\*f2\_high + f1\_high |
| IMD frequency limit (MHz) | 8850 | 9945 | 11750 | 14515 |
| 4th order IMD products | 2\*f1\_low – 2\*f2\_high | 2\*f1\_high – 2\*f2\_low | 2\*f1\_low + 2\*f2\_low | 2\*f1\_high + 2\*f2\_high |
| IMD frequency limit (MHz) | 4700 | 2770 | 10300 | 12230 |
| 5th order IMD products | f1\_low – 4\*f2\_high | f1\_high – 4\*f2\_low | f2\_low – 4\*f1\_high | f2\_high – 4\*f1\_low |
| IMD frequency limit (MHz) | 14950 | 11285 | 4360 | 3200 |
| 5th order IMD products | f1\_low + 4\*f2\_low | f1\_high + 4\*f2\_high | f2\_low + 4\*f1\_low | f2\_high + 4\*f1\_high |
| IMD frequency limit (MHz) | 15050 | 18715 | 10700 | 11860 |
| 5th order IMD products | 2\*f1\_low – 3\*f2\_high | 2\*f1\_high - 3\*f2\_low | 2\*f2\_low – 3\*f1\_high | 2\*f2\_high – 3\*f1\_low |
| IMD frequency limit (MHz) | 8900 | 6070 | 855 | 2850 |
| 5th order IMD products | 2\*f1\_low + 3\*f2\_low | 2\*f1\_high + 3\*f2\_high | 2\*f2\_low + 3\*f1\_low | 2\*f2\_high + 3\*f1\_high |
| IMD frequency limit (MHz) | 13600 | 16430 | 12150 | 14145 |

For UE coexistence study of Band 66 + Band n77, the 2nd, 3rd, 4th and 5th order harmonics and 2nd, 3rd, 4th and 5th order intermodulation products were calculated and presented in Table 5.99.2-2.

**Table 5.99.2-2: Harmonic and IMD analysis for DC\_66\_n77**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| UE UL carriers | f1\_low | f1\_high | f2\_low | f2\_high |
| UL frequencies (MHz) | 1710 | 1780 | 3300 | 4200 |
| 2nd harmonic | 2\* f1\_low | 2\*f1\_high | 2\*f2\_low | 2\*f2\_high |
| harmonic frequency limit (MHz) | 3420 | 3560 | 6600 | 8400 |
| 3rd harmonic | 3\* f1\_low | 3\*f1\_high | 3\*f2\_low | 3\*f2\_high |
| harmonic frequency limit (MHz) | 5130 | 5340 | 9900 | 12600 |
| 2nd order IMD products | f2\_low – f1\_high | f2\_high – f1\_low | f2\_low + f1\_low | f2\_high + f1\_high |
| IMD frequency limit (MHz) | 1520 | 2490 | 5010 | 5980 |
| 3rd order IMD products | 2\*f1\_low – f2\_high | 2\*f1\_high – f2\_low | 2\*f2\_low – f1\_high | 2\*f2\_high – f1\_low |
| IMD frequency limit (MHz) | 780 | 260 | 4820 | 6690 |
| 3rd order IMD products | 2\*f1\_low + f2\_low | 2\*f1\_high + f2\_high | 2\*f2\_low + f1\_low | 2\*f2\_high + f1\_high |
| IMD frequency limit (MHz) | 6720 | 7760 | 8310 | 10180 |
| 4th order IMD products | 3\*f1\_low – f2\_high | 3\*f1\_high – f2\_low | 3\*f2\_low – f1\_high | 3\*f2\_high – f1\_low |
| IMD frequency limit (MHz) | 930 | 2040 | 8120 | 10890 |
| 4th order IMD products | 3\*f1\_low + f2\_low | 3\*f1\_high + f2\_high | 3\*f2\_low + f1\_low | 3\*f2\_high + f1\_high |
| IMD frequency limit (MHz) | 8430 | 9540 | 11610 | 14380 |
| 4th order IMD products | 2\*f1\_low – 2\*f2\_high | 2\*f1\_high – 2\*f2\_low | 2\*f1\_low + 2\*f2\_low | 2\*f1\_high + 2\*f2\_high |
| IMD frequency limit (MHz) | -4980 | -3040 | 10020 | 11960 |
| 5th order IMD products | f1\_low – 4\*f2\_high | f1\_high – 4\*f2\_low | f2\_low – 4\*f1\_high | f2\_high – 4\*f1\_low |
| IMD frequency limit (MHz) | 15090 | 11420 | 3820 | 2640 |
| 5th order IMD products | f1\_low + 4\*f2\_low | f1\_high + 4\*f2\_high | f2\_low + 4\*f1\_low | f2\_high + 4\*f1\_high |
| IMD frequency limit (MHz) | 14910 | 18580 | 10140 | 11320 |
| 5th order IMD products | 2\*f1\_low – 3\*f2\_high | 2\*f1\_high - 3\*f2\_low | 2\*f2\_low – 3\*f1\_high | 2\*f2\_high – 3\*f1\_low |
| IMD frequency limit (MHz) | 9180 | 6340 | 1260 | 3270 |
| 5th order IMD products | 2\*f1\_low + 3\*f2\_low | 2\*f1\_high + 3\*f2\_high | 2\*f2\_low + 3\*f1\_low | 2\*f2\_high + 3\*f1\_high |
| IMD frequency limit (MHz) | 13320 | 16160 | 11730 | 13740 |

Based on co-existence study as presented in the table 5.99.2-1 and 5.99.2-2, own Rx impact is shown in the following.

* The 2nd harmonic of band 25 may fall into own Rx of band n77
* The 2nd, 4th and 5th order IMD generated by dual uplink of 25+n77 may fall into own Rx of band 25 and 66
* The 4th and 5th order IMD generated by dual uplink of 25+n77 may fall into own Rx of n77
* The 2nd harmonic of band 66 may fall into own Rx of band n77
* The 2nd, 4th and 5th order IMD generated by dual uplink of 66+n77 may fall into own Rx of band 25 and 66
* The 4th and 5th order IMD generated by dual uplink of 66+n77 may fall into own Rx of band n77

### 5.99.3 ∆TIB and ∆RIB values

The same relaxation values as DC\_2-66\_n77 is used for DC\_25-66\_n77.

Table 5.99.3-1: ΔTIB,c

| Inter-band DC Configuration | E-UTRA and NR Band | ΔTIB,c [dB] |
| --- | --- | --- |
| DC\_25-66\_n77  DC\_25-25-66\_n77 | 25 | 0.6 |
| 66 | 0.6 |
| n77 | 0.8 |

**Table 5.99.3-2: ΔRIB**

| Inter-band DC Configuration | E-UTRA and NR Band | ΔRIB [dB] |
| --- | --- | --- |
| DC\_25-66\_n77  DC\_25-25-66\_n77 | 25 | 0.2 |
| 66 | 0.2 |
| n77 | 0.5 |

### 5.99.4 Reference sensitivity exceptions

The IMD issues specifc to 3DL/2UL is the IMD2/4/5 for 25+n77 falling into band 66 and for 66+n77 falling into band 25. This issues are similar to DC\_2-66\_n77 and the same MSD is used.

Table 5.99.4-1: MSD test points 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\_25A-66A\_n77A  DC\_25A-25A-66A\_n77A | 25 | 1855 | 5 | 25 | 1935 | N/A | N/A |
| 66 | 1765 | 5 | 25 | 2165 | 29.2 | IMD2 |
| n77 | 4020 | 10 | 25 | 4020 | N/A | N/A |
| 25 | 1905 | 5 | 25 | 1985 | M/A | N/A |
| 66 | 1720 | 5 | 25 | 2120 | 10.4 | IMD4 |
| n77 | 3595 | 10 | 25 | 3595 | N/A | N/A |
| 25 | 1885 | 5 | 25 | 1965 | M/A | N/A |
| 66 | 1775 | 5 | 25 | 2175 | 4.0 | IMD5 |
| n77 | 3915 | 10 | 25 | 3915 | N/A | N/A |
| 25 | 1880 | 5 | 25 | 1960 | 32.1 | IMD2 |
| 66 | 1740 | 5 | 25 | 2140 | N/A | N/A |
| n77 | 3700 | 10 | 25 | 3700 | N/A | N/A |
| 25 | 1860 | 5 | 25 | 1940 | 9.1 | IMD4 |
| 66 | 1775 | 5 | 25 | 2175 | N/A | N/A |
| n77 | 3385 | 10 | 25 | 3385 | N/A | N/A |
| 25 | 1900 | 5 | 25 | 1980 | 4.2 | IMD5 |
| 66 | 1770 | 5 | 25 | 2170 | N/A | N/A |
| n77 | 3645 | 10 | 25 | 3645 | N/A | N/A |

## 5.100 DC\_25-66\_n78

5.100.1 Operating bands for DC

Table 5.100.1-1: Inter-band DC configurations (three bands)

| DC  configuration | Uplink configuration |
| --- | --- |
| DC\_25A-66A\_n78A  DC\_25A-25A-66A\_n78A | DC\_25A\_n78A  DC\_66A\_n78A |

### 5.100.2 Co-existence studies

For UE coexistence study of Band 25 + Band n78, the 2nd, 3rd, 4th and 5th order harmonics and 2nd, 3rd, 4th and 5th order intermodulation products were calculated and presented in Table 5.100.2-1.

**Table 5.100.2-1: Harmonic and IMD analysis for DC\_25\_n78**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| UE UL carriers | f1\_low | f1\_high | f2\_low | f2\_high |
| UL frequencies (MHz) | 1850 | 1915 | 3300 | 3800 |
| 2nd harmonic | 2\* f1\_low | 2\*f1\_high | 2\*f2\_low | 2\*f2\_high |
| harmonic frequency limit (MHz) | 3700 | 3830 | 6600 | 7600 |
| 3rd harmonic | 3\* f1\_low | 3\*f1\_high | 3\*f2\_low | 3\*f2\_high |
| harmonic frequency limit (MHz) | 5550 | 5745 | 9900 | 11400 |
| 2nd order IMD products | f2\_low – f1\_high | f2\_high – f1\_low | f2\_low + f1\_low | f2\_high + f1\_high |
| IMD frequency limit (MHz) | 1385 | 1950 | 5150 | 5715 |
| 3rd order IMD products | 2\*f1\_low – f2\_high | 2\*f1\_high – f2\_low | 2\*f2\_low – f1\_high | 2\*f2\_high – f1\_low |
| IMD frequency limit (MHz) | 100 | 530 | 4685 | 5750 |
| 3rd order IMD products | 2\*f1\_low + f2\_low | 2\*f1\_high + f2\_high | 2\*f2\_low + f1\_low | 2\*f2\_high + f1\_high |
| IMD frequency limit (MHz) | 7000 | 7630 | 8450 | 9515 |
| 4th order IMD products | 3\*f1\_low – f2\_high | 3\*f1\_high – f2\_low | 3\*f2\_low – f1\_high | 3\*f2\_high – f1\_low |
| IMD frequency limit (MHz) | 1750 | 2445 | 7985 | 9550 |
| 4th order IMD products | 3\*f1\_low + f2\_low | 3\*f1\_high + f2\_high | 3\*f2\_low + f1\_low | 3\*f2\_high + f1\_high |
| IMD frequency limit (MHz) | 8850 | 9545 | 11750 | 13315 |
| 4th order IMD products | 2\*f1\_low – 2\*f2\_high | 2\*f1\_high – 2\*f2\_low | 2\*f1\_low + 2\*f2\_low | 2\*f1\_high + 2\*f2\_high |
| IMD frequency limit (MHz) | 3900 | 2770 | 10300 | 11430 |
| 5th order IMD products | f1\_low – 4\*f2\_high | f1\_high – 4\*f2\_low | f2\_low – 4\*f1\_high | f2\_high – 4\*f1\_low |
| IMD frequency limit (MHz) | 13350 | 11285 | 4360 | 3600 |
| 5th order IMD products | f1\_low + 4\*f2\_low | f1\_high + 4\*f2\_high | f2\_low + 4\*f1\_low | f2\_high + 4\*f1\_high |
| IMD frequency limit (MHz) | 15050 | 17115 | 10700 | 11460 |
| 5th order IMD products | 2\*f1\_low – 3\*f2\_high | 2\*f1\_high - 3\*f2\_low | 2\*f2\_low – 3\*f1\_high | 2\*f2\_high – 3\*f1\_low |
| IMD frequency limit (MHz) | 7700 | 6070 | 855 | 2050 |
| 5th order IMD products | 2\*f1\_low + 3\*f2\_low | 2\*f1\_high + 3\*f2\_high | 2\*f2\_low + 3\*f1\_low | 2\*f2\_high + 3\*f1\_high |
| IMD frequency limit (MHz) | 13600 | 15230 | 12150 | 13345 |

For UE coexistence study of Band 66 + Band n78, the 2nd, 3rd, 4th and 5th order harmonics and 2nd, 3rd, 4th and 5th order intermodulation products were calculated and presented in Table 5.100.2-2.

**Table 5.100.2-2: Harmonic and IMD analysis for DC\_66\_n78**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| UE UL carriers | f1\_low | f1\_high | f2\_low | f2\_high |
| UL frequencies (MHz) | 1710 | 1780 | 3300 | 3800 |
| 2nd harmonic | 2\* f1\_low | 2\*f1\_high | 2\*f2\_low | 2\*f2\_high |
| harmonic frequency limit (MHz) | 3420 | 3560 | 6600 | 7600 |
| 3rd harmonic | 3\* f1\_low | 3\*f1\_high | 3\*f2\_low | 3\*f2\_high |
| harmonic frequency limit (MHz) | 5130 | 5340 | 9900 | 11400 |
| 2nd order IMD products | f2\_low – f1\_high | f2\_high – f1\_low | f2\_low + f1\_low | f2\_high + f1\_high |
| IMD frequency limit (MHz) | 1520 | 2090 | 5010 | 5580 |
| 3rd order IMD products | 2\*f1\_low – f2\_high | 2\*f1\_high – f2\_low | 2\*f2\_low – f1\_high | 2\*f2\_high – f1\_low |
| IMD frequency limit (MHz) | 380 | 260 | 4820 | 5890 |
| 3rd order IMD products | 2\*f1\_low + f2\_low | 2\*f1\_high + f2\_high | 2\*f2\_low + f1\_low | 2\*f2\_high + f1\_high |
| IMD frequency limit (MHz) | 6720 | 7360 | 8310 | 9380 |
| 4th order IMD products | 3\*f1\_low – f2\_high | 3\*f1\_high – f2\_low | 3\*f2\_low – f1\_high | 3\*f2\_high – f1\_low |
| IMD frequency limit (MHz) | 1330 | 2040 | 8120 | 9690 |
| 4th order IMD products | 3\*f1\_low + f2\_low | 3\*f1\_high + f2\_high | 3\*f2\_low + f1\_low | 3\*f2\_high + f1\_high |
| IMD frequency limit (MHz) | 8430 | 9140 | 11610 | 13180 |
| 4th order IMD products | 2\*f1\_low – 2\*f2\_high | 2\*f1\_high – 2\*f2\_low | 2\*f1\_low + 2\*f2\_low | 2\*f1\_high + 2\*f2\_high |
| IMD frequency limit (MHz) | 4180 | 3040 | 10020 | 11160 |
| 5th order IMD products | f1\_low – 4\*f2\_high | f1\_high – 4\*f2\_low | f2\_low – 4\*f1\_high | f2\_high – 4\*f1\_low |
| IMD frequency limit (MHz) | 13490 | 11420 | 3820 | 3040 |
| 5th order IMD products | f1\_low + 4\*f2\_low | f1\_high + 4\*f2\_high | f2\_low + 4\*f1\_low | f2\_high + 4\*f1\_high |
| IMD frequency limit (MHz) | 14910 | 16980 | 10140 | 10920 |
| 5th order IMD products | 2\*f1\_low – 3\*f2\_high | 2\*f1\_high - 3\*f2\_low | 2\*f2\_low – 3\*f1\_high | 2\*f2\_high – 3\*f1\_low |
| IMD frequency limit (MHz) | 980 | 6340 | 1260 | 2470 |
| 5th order IMD products | 2\*f1\_low + 3\*f2\_low | 2\*f1\_high + 3\*f2\_high | 2\*f2\_low + 3\*f1\_low | 2\*f2\_high + 3\*f1\_high |
| IMD frequency limit (MHz) | 13320 | 14960 | 11730 | 12940 |

Based on co-existence study as presented in the table 5.100.2-1 and 5.100.2-2, own Rx impact is shown in the following.

* The 2nd harmonic of band 25 may fall into own Rx of band n78
* The 2nd, 4th and 5th order IMD generated by dual uplink of 25+n78 may fall into own Rx of band 25
* The 4th order IMD generated by dual uplink of 25+n78 may fall into own Rx of band 66
* The 4th and 5th order IMD generated by dual uplink of 25+n78 may fall into own Rx of n78
* The 2nd harmonic of band 66 may fall into own Rx of band n78
* The 2nd, 4th and 5th order IMD generated by dual uplink of 66+n78 may fall into own Rx of band 25 and 66
* The 4th and 5th order IMD generated by dual uplink of 66+n78 may fall into own Rx of band n78

### 5.100.3 ∆TIB and ∆RIB values

The same relaxation values as DC\_2-66\_n78 is used for DC\_25-66\_n78.

Table 5.100.3-1: ΔTIB,c

| Inter-band DC Configuration | E-UTRA and NR Band | ΔTIB,c [dB] |
| --- | --- | --- |
| DC\_25-66\_n78  DC\_25-25-66\_n78 | 25 | 0.6 |
| 66 | 0.6 |
| n78 | 0.8 |

**Table 5.100.3-2: ΔRIB**

| Inter-band DC Configuration | E-UTRA and NR Band | ΔRIB [dB] |
| --- | --- | --- |
| DC\_25-66\_n78  DC\_25-25-66\_n78 | 25 | 0.2 |
| 66 | 0.2 |
| n78 | 0.5 |

### 5.100.4 Reference sensitivity exceptions

The IMD issues specifc to 3DL/2UL is the IMD4/5 for 25+n78 falling into band 66 and IMD2/4/5 for 66+n78 falling into band 25. This issues are similar to DC\_2-66\_n78 and the same MSD is used.

Table 5.100.4-1: MSD test points 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\_25A-66A\_n78A  DC\_25A-25A-66A\_n78A | 25 | 1880 | 5 | 25 | 1960 | M/A | N/A |
| 66 | 1760 | 5 | 25 | 2160 | 10.4 | IMD4 |
| n78 | 3480 | 10 | 50 | 3480 | N/A | N/A |
| 25 | 1880 | 5 | 25 | 1960 | 32.1 | IMD2 |
| 66 | 1740 | 5 | 25 | 2140 | N/A | N/A |
| n78 | 3700 | 10 | 50 | 3700 | N/A | N/A |
| 25 | 1880 | 5 | 25 | 1960 | 9.1 | IMD4 |
| 66 | 1770 | 5 | 25 | 2170 | N/A | N/A |
| n78 | 3350 | 10 | 50 | 3350 | N/A | N/A |
| 25 | 1900 | 5 | 25 | 1980 | 4.2 | IMD5 |
| 66 | 1770 | 5 | 25 | 2170 | N/A | N/A |
| n78 | 3645 | 10 | 25 | 3645 | N/A | N/A |

## 5.101 DC\_2-29\_n78

5.101.1 Operating bands for DC

Table 5.101.1-1: Band combinations EN-DC (three bands)

| EN-DC Band | E-UTRA Band | NR Band | Single UL allowed |
| --- | --- | --- | --- |
| DC\_2-29\_n78 | CA\_2-29 | n78 | DC\_2\_n78 |

5.101.2 Configurations for DC

Table 5.101.2-1: Inter-band EN-DC configurations (three bands)

| EN-DC  configuration | Uplink EN-DC  configuration  (NOTE 1) | E-UTRA configuration | NR configuration |
| --- | --- | --- | --- |
| DC\_2A-29A\_n78A | DC\_2A\_n78A | CA\_2A-29A | n78 |

5.101.3 Co-existence studies

Based on co-existence studies of DC\_2A-29A\_n78A with 2UL, it can get that:

- no IMD of band 2 UL and band n78 UL falling to band 29 DL

5.101.4 ∆TIB and ∆RIB values

For DC\_2A-29A\_n78A, the ΔTIB,c and ΔRIB,c values are reused from the LTE combination CA\_2-13-48, and are given in the tables below.

Table 5.101.4-1: ΔTIB,c

| Inter-band DC Configuration | E-UTRA and NR Band | ΔTIB,c [dB] |
| --- | --- | --- |
| DC\_2-29-n78 | 2 | 0.6 |
| n78 | 0.8 |

**Table 5.101.4-2: ΔRIB**

| Inter-band DC Configuration | E-UTRA and NR Band | ΔRIB [dB] |
| --- | --- | --- |
| DC\_2-29-n78 | 2 | 0.2 |
| n78 | 0.5 |

5.101.5 REFSENS requirements

Although DC\_29\_n78 is not defined, 5th order harmonic mixing is from the band n78 UL and DL on band 29 existed and need be considered here. DC\_29\_n78’s MSD can refer to DC\_28-n78 values. Below table can be merged into 38.101-3 Table 7.3B.2.3.2-1 and Table 7.3B.2.3.2-2 respectively:

Table 5.101.5-1: Reference sensitivity exceptions (MSD) due to receiver harmonic mixing for EN-DC in NR FR1

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| E-UTRA or NR Band / Channel bandwidth of the affected DL band / MSD | | | | | | | | | | | | |
| UL band | DL band | 5  MHz  (dB) | 10 MHz  (dB) | 15 MHz  (dB) | 20 MHz  (dB) | 25 MHz  (dB) | 40 MHz  (dB) | 50 MHz  (dB) | 60 MHz  (dB) | 80 MHz  (dB) | 90 MHz  (dB) | 100 MHz  (dB) |
| n78 | 292 | 28 | 25 |  |  |  |  |  |  |  |  |  |
| NOTE 2: The requirements should be verified for DL EARFCN of the victim (lower) band (superscript LB) such that  with  the DL carrier frequency in the lower band and the UL carrier frequency in the higher band, both in MHz. | | | | | | | | | | | | |

Table 5.101.5-2: Uplink configuration for reference sensitivity exceptions due to receiver harmonic mixing for EN-DC in NR FR1

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| E-UTRA or NR Band / SCS / Channel bandwidth of the affected DL band / UL RB allocation of the agressor band | | | | | | | | | | | | | |
| UL band | DL band | SCS of UL band  (kHz) | 5 MHz  (LCRB) | 10 MHz  (LCRB) | 15 MHz  (LCRB) | 20 MHz  (LCRB) | 25 MHz  (LCRB) | 40 MHz  (LCRB) | 50 MHz  (LCRB) | 60 MHz  (LCRB) | 80 MHz  (LCRB) | 90 MHz  (LCRB) | 100 MHz  (LCRB) |
| n78 | 29 | 15 | 25 | 50 |  |  |  |  |  |  |  |  |  |

## 5.102 DC\_29-66\_n78

5.102.1 Operating bands for DC

Table 5.102.1-1: Band combinations EN-DC (three bands)

| EN-DC Band | E-UTRA Band | NR Band | Single UL allowed |
| --- | --- | --- | --- |
| DC\_29-66\_n78 | CA\_29-66 | n78 | DC\_66\_n78 |

5.102.2 Configurations for DC

Table 5.102.2-1: Inter-band EN-DC configurations (three bands)

| EN-DC  configuration | Uplink EN-DC  configuration  (NOTE 1) | E-UTRA configuration | NR configuration |
| --- | --- | --- | --- |
| DC\_29A-66A\_n78A | DC\_66A\_n78A | CA\_29A-66A | n78 |

5.102.3 Co-existence studies

Based on co-existence studies of DC\_29A-66A\_n78A with 2UL, it can get that:

- no IMD of band 66 UL and band n78 UL falling to band 29 DL

Although DC\_29\_n78 is not defined, 5th order harmonic mixing is from the band n78 UL and DL on band 29 existed and need be considered here.

5.102.4 ∆TIB and ∆RIB values

For DC\_29A-66A\_n78A, the ΔTIB,c and ΔRIB,c values are reused from the LTE combination CA\_13-48-66, and are given in the tables below.

Table 5.102.4-1: ΔTIB,c

| Inter-band DC Configuration | E-UTRA and NR Band | ΔTIB,c [dB] |
| --- | --- | --- |
| DC\_29-66-n78 | 66 | 0.6 |
| n78 | 0.8 |

**Table 5.102.4-2: ΔRIB**

| Inter-band DC Configuration | E-UTRA and NR Band | ΔRIB [dB] |
| --- | --- | --- |
| DC\_29-66-n78 | 66 | 0.2 |
| n78 | 0.5 |

5.102.5 REFSENS requirements

Although DC\_29\_n78 is not defined, 5th order harmonic mixing is from the band n78 UL and DL on band 29 existed and need be considered here. DC\_29\_n78’s MSD can refer to DC\_28-n78 values. Below table can be merged into 38.101-3 Table 7.3B.2.3.2-1 and Table 7.3B.2.3.2-2 respectively:

Table 5.102.5-1: Reference sensitivity exceptions (MSD) due to receiver harmonic mixing for EN-DC in NR FR1

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| E-UTRA or NR Band / Channel bandwidth of the affected DL band / MSD | | | | | | | | | | | | |
| UL band | DL band | 5  MHz  (dB) | 10 MHz  (dB) | 15 MHz  (dB) | 20 MHz  (dB) | 25 MHz  (dB) | 40 MHz  (dB) | 50 MHz  (dB) | 60 MHz  (dB) | 80 MHz  (dB) | 90 MHz  (dB) | 100 MHz  (dB) |
| n78 | 292 | 28 | 25 |  |  |  |  |  |  |  |  |  |
| NOTE 2: The requirements should be verified for DL EARFCN of the victim (lower) band (superscript LB) such that  with  the DL carrier frequency in the lower band and the UL carrier frequency in the higher band, both in MHz. | | | | | | | | | | | | |

Table 5.102.5-2: Uplink configuration for reference sensitivity exceptions due to receiver harmonic mixing for EN-DC in NR FR1

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| E-UTRA or NR Band / SCS / Channel bandwidth of the affected DL band / UL RB allocation of the agressor band | | | | | | | | | | | | | |
| UL band | DL band | SCS of UL band  (kHz) | 5 MHz  (LCRB) | 10 MHz  (LCRB) | 15 MHz  (LCRB) | 20 MHz  (LCRB) | 25 MHz  (LCRB) | 40 MHz  (LCRB) | 50 MHz  (LCRB) | 60 MHz  (LCRB) | 80 MHz  (LCRB) | 90 MHz  (LCRB) | 100 MHz  (LCRB) |
| n78 | 29 | 15 | 25 | 50 |  |  |  |  |  |  |  |  |  |

## 5.103 DC\_1-21\_n28

### 5.103.1 Configurations for DC

The frequency range in band n28 is restricted for this band combination to 728 - 738 MHz for the UL and 783-793 MHz for the DL because only a certain operator uses band 21. This restriction is mentioned in TP for DC\_21\_n28 (R4-2100352).

Table 5.103.1-1: Inter-band DC configurations (three bands)

| DC  configuration | Uplink configuration |
| --- | --- |
| DC\_1A-21A\_n28A | DC\_1A\_n28A  DC\_21A\_n28A |

### 5.103.2 Co-existence studies

Based on co-existence studies of DC\_1\_n28 and DC\_21\_n28, own Rx impact of the 3rd band is the followings.

- 2nd order IMD products generated by DC\_21\_n28 uplink may fall into own Rx of band 1.

- 3rd order IMD products generated by DC\_21\_n28 uplink may fall into own Rx of band 1.

### 5.103.3 ∆TIB and ∆RIB values

For DC\_1-21\_n28, the ΔTIB,c and ΔRIB,c values are reused from the LTE combination CA\_1-21-28, and are given in the tables below.

Table 5.103.3-1: ΔTIB,c

| Inter-band DC Configuration | E-UTRA and NR Band | ΔTIB,c [dB] |
| --- | --- | --- |
| DC\_1-21\_n28 | 1 | 0.3 |
| 21 | 0.4 |
| n28 | 0.6 |

**Table 5.103.3-2: ΔRIB**

| Inter-band DC Configuration | E-UTRA and NR Band | ΔRIB [dB] |
| --- | --- | --- |
| DC\_1-21\_n28 | 1 | 0 |
| 21 | 0 |
| n28 | 0.2 |

### 5.103.4 Reference sensitivity exceptions

- 2nd order IMD products generated by DC\_21\_n28 uplink may fall into own Rx of band 1.

⇒ IMD was calculated based on the frequency range in band n28 that the operator actually owned, which resulted in that IMD2 doesn’t fall into own Rx of band 1. Therefore, we didn’t specify MSD.

- 3rd order IMD products generated by DC\_21\_n28 uplink may fall into own Rx of band 1.

⇒ The MSD values are shown in the following table. These values are the average of the analysis results of the two companies. [1][2]

Table 5.103.4-1: 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-21A\_n28AX1 | 1 | 1975.3 | 5 | 25 | 2165.3 | 16.1 | IMD3 |
| 21 | 1450.4 | 5 | 25 | 1498.4 | N/A | N/A |
| n28 | 735.5 | 5 | 25 | 790.5 | N/A | N/A |
| NOTE X1: The frequency range in band n28 is restricted for this band combination to 728 - 738 MHz for the UL and 783 - 793 MHz for the DL. This band is subject to IMD2 fall in B1 also which MSD is not specified. | | | | | | | |

## 5.104 DC\_3-21\_n28

### 5.104.1 Configurations for DC

The frequency range in band n28 is restricted for this band combination to 728 - 738 MHz for the UL and 783-793 MHz for the DL because only a certain operator uses band 21. This restriction is mentioned in TP for DC\_21\_n28 (R4-2100352).

Table 5.104.1-1: Inter-band DC configurations (three bands)

| DC  configuration | Uplink configuration |
| --- | --- |
| DC\_3A-21A\_n28A | DC\_3A\_n28A  DC\_21A\_n28A |

### 5.104.2 Co-existence studies

Based on co-existence studies of DC\_3\_n28 and DC\_21\_n28, own Rx impact of the 3rd band is the followings.

- IMD generated by DC\_3\_n28 uplink doesn’t fall into own Rx of band 21.

- IMD generated by DC\_21\_n28 uplink doesn’t fall into own Rx of band 3.

### 5.104.3 ∆TIB and ∆RIB values

For DC\_3-21\_n28, the ΔTIB,c and ΔRIB,c values are reused from the LTE combination CA\_3-21-28, and are given in the tables below.

Table 5.104.3-1: ΔTIB,c

| Inter-band DC Configuration | E-UTRA and NR Band | ΔTIB,c [dB] |
| --- | --- | --- |
| DC\_3-21\_n28 | 3 | 0.8 |
| 21 | 0.9 |
| n28 | 0.3 |

**Table 5.104.3-2: ΔRIB**

| Inter-band DC Configuration | E-UTRA and NR Band | ΔRIB [dB] |
| --- | --- | --- |
| DC\_3-21\_n28 | 3 | 0.3 |
| 21 | 0.5 |
| n28 | 0 |

### 5.104.4 Reference sensitivity exceptions

Based on co-existence studies of DC\_3-21\_n28, there is no need to have MSD added.

## 5.105 DC\_8-20\_n1

### 5.105.1 Configurations for DC

Table 5.105.1-1: Inter-band DC configurations (three bands)

| DC  configuration | Uplink configuration |
| --- | --- |
| DC\_8A-20A\_n1A | DC\_8A\_n1A  DC\_20A\_n1A |

### 5.105.2 Co-existence studies

Table 5.105.2-1 lists the Band 8A + 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 5.105.2-1: Band 8 and Band n1 UL harmonics and IMD products

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **UE UL carriers** | **fx\_low** | **fx\_high** | | **fn\_low** | **fn\_high** | |
| UL frequency (MHz) | 880 | 915 | | 1920 | 1980 | |
| 2nd harmonics frequency limits | 2\*fx\_low | 2\*fx\_high | | 2\* fn\_low | 2\* fn\_high | |
| 2nd harmonics frequency limits (MHz) | 1760 – 1830 | | | 3840 – 3960 | | |
| 3rd harmonics frequency limits | 3\*fx\_low | | 3\*fx\_high | 3\* fn\_low | | 3\* fn\_high |
| 3rd harmonics frequency limits (MHz) | 2640 – 2745 | | | 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) | 1005 – 1100 | | | 2800 – 2895 | | |
| 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) | 90 – 220 | | | 2925 – 3080 | | |
| 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) | 3680 – 3810 | | | 4720 – 4875 | | |
| 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) | 830 – 965 | | | 1910 – 1990 | | |
| 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) | 660 – 825 | | | 4845 – 5060 | | |
| 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) | 2010 – 2200 | | | 5600 – 5790 | | |
| 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) | 4560 – 4725 | | | 6640 – 6855 | | |
| 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) | 6765 – 7040 | | | 1540 – 1740 | | |
| 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 – 4180 | | | 1095 – 1320 | | |
| 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) | 8560 – 8835 | | | 5440 – 5640 | | |
| 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) | 7520 – 7770 | | | 6480 – 6705 | | |

Based on Table 5.105.2-1,

- 2nd order harmonics may fall into Rx frequencies of bands 7, 41, 77 and 90

- 3rd order harmonics may fall into Rx frequencies of bands 3, 46 and 47

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

- 4th order IMD may fall into Rx frequencies of bands 1, 4, 10, 12, 13, 14, 17, 20, 23, 28, 29, 34, 44, 46, 65, 66, 67, 68, 70, 79, 79 and 85

- 5th order IMD may fall into Rx frequencies of bands 24, 46 and 77

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 5.105.2-2 lists if up to 3rd order harmonics and IMD up to 5th order falls into one of these receiving bands.

Table 5.105.2-2: 2UL Band 8 + Band n1 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 | 3rd Harmonic, IMD4, IMD5 |
| 5150 | - | 5350 | No | Europe |  |
| 5470 | - | 5725 | Yes | IMD4, IMD5 |
| 5150 | - | 5825 | Yes | Asia | 3rd Harmonic, IMD4, IMD5 |

The requirements for spurious emission band UE coexistence exist for DC\_8\_n1 in 38101-3.

Table 5.105.2-3 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 5.105.2-3: 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 5.105.2-3,

- 2nd order harmonics may fall into Rx frequencies of bands 38, 41, 69, 77 and 90

- 3rd order harmonics may fall into Rx frequencies of bands 46 and 47

- 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 5.105.2-4 lists if up to 3rd order harmonics and IMD up to 5th order falls into one of these receiving bands.

Table 5.105.2-4: 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 | 3rd Harmonic, IMD4, IMD5 |
| 5150 | - | 5350 | Yes | Europe | IMD5 |
| 5470 | - | 5725 | Yes | IMD4 |
| 5150 | - | 5825 | Yes | Asia | 3rd Harmonic, IMD4, IMD5 |

The requirements for spurious emission band UE coexistence exist for DC\_20\_n1 in 38101-3.

### 5.105.3 ∆TIB and ∆RIB values

Table 5.105.3-1: ΔTIB,c

| Inter-band DC Configuration | E-UTRA and NR Band | ΔTIB,c [dB] |
| --- | --- | --- |
| DC\_8A-20A\_n1 | 8 | 0.4 |
| 20 | 0.4 |
| n1 | 0.3 |

**Table 5.105.3-2: ΔRIB**

| Inter-band DC Configuration | E-UTRA and NR Band | ΔRIB [dB] |
| --- | --- | --- |
| DC\_8A-20A\_n1 | 8 | 0 |
| 20 | 0 |
| n1 | 0 |

### 5.105.4 Reference sensitivity exceptions

B20 MSD due to IMD4 of 8-n1 is TBD.

## Further study required to agree on achievable performance for LB quadplexer.5.106 DC\_8-20\_n3

### 5.106.1 Configurations for DC

Table 5.106.1-1: Inter-band DC configurations (three bands)

| DC  configuration | Uplink configuration |
| --- | --- |
| DC\_8A-20A\_n3A | DC\_8A\_n3A  DC\_20A\_n3A |

### 5.106.2 Co-existence studies

Table 5.106.2-1 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 5.106.2-1: 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 5.106.2-1,

- 2nd order harmonics may fall into Rx frequencies of bands 7, 22, 41, 42, 48, 49, 77, 78 and 90

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

- 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 5.106.2-2 lists if up to 3rd order harmonics and IMD up to 5th order falls into one of these receiving bands.

Table 5.106.2-2: 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 | 3rd Harmonic, IMD4, IMD5 |
| 5150 | - | 5350 | Yes | Europe | 3rd Harmonic, IMD4, IMD5 |
| 5470 | - | 5725 | No |  |
| 5150 | - | 5825 | Yes | Asia | 3rd Harmonic, IMD4, IMD5 |

The requirements for spurious emission band UE coexistence exist for DC\_8\_n3 in 38101-3.

Table 5.106.2-3 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 5.106.2-3: 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 5.106.2-3,

- 2nd order harmonics may fall into Rx frequencies of bands 22, 38, 41, 42, 48, 49, 69, 77, 78 and 90

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

- 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 5.106.2-4 lists if up to 3rd order harmonics and IMD up to 5th order falls into one of these receiving bands.

Table 5.106.2-4: 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 | 3rd Harmonic, IMD4, IMD5 |
| 5150 | - | 5350 | Yes | Europe | 3rd Harmonic, IMD4, IMD5 |
| 5470 | - | 5725 | No |  |
| 5150 | - | 5825 | Yes | Asia | 3rd Harmonic, IMD4, IMD5 |

The requirements for spurious emission band UE coexistence exist for DC\_20\_n3 in 38101-3.

### 5.106.3 ∆TIB and ∆RIB values

Table 5.106.3-1: ΔTIB,c

| Inter-band DC Configuration | E-UTRA and NR Band | ΔTIB,c [dB] |
| --- | --- | --- |
| DC\_8A-20A\_n3 | 8 | 0.4 |
| 20 | 0.4 |
| n3 | 0.3 |

**Table 5.106.3-2: ΔRIB**

| Inter-band DC Configuration | E-UTRA and NR Band | ΔRIB [dB] |
| --- | --- | --- |
| DC\_8A-20A\_n3 | 8 | 0 |
| 20 | 0 |
| n3 | 0 |

### 5.106.4 Reference sensitivity exceptions

B20 and B8 MSD for IMD2 of 8-n3 and 20-n3 uplinks respectively is TBD.Further study required to agree on achievable performance of LB quadplexer.

## 5.107 DC\_8-32\_n1

### 5.107.1 Configurations for DC

Table 5.107.1-1: Inter-band DC configurations (three bands)

| DC  configuration | Uplink configuration |
| --- | --- |
| DC\_8A-32A\_n1A | DC\_8A\_n1A |

### 5.107.2 Co-existence studies

Table 5.107.2-1 lists the Band 8A + 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 5.107.2-1: Band 8 and Band n1 UL harmonics and IMD products

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **UE UL carriers** | **fx\_low** | **fx\_high** | | **fn\_low** | **fn\_high** | |
| UL frequency (MHz) | 880 | 915 | | 1920 | 1980 | |
| 2nd harmonics frequency limits | 2\*fx\_low | 2\*fx\_high | | 2\* fn\_low | 2\* fn\_high | |
| 2nd harmonics frequency limits (MHz) | 1760 – 1830 | | | 3840 – 3960 | | |
| 3rd harmonics frequency limits | 3\*fx\_low | | 3\*fx\_high | 3\* fn\_low | | 3\* fn\_high |
| 3rd harmonics frequency limits (MHz) | 2640 – 2745 | | | 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) | 1005 – 1100 | | | 2800 – 2895 | | |
| 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) | 90 – 220 | | | 2925 – 3080 | | |
| 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) | 3680 – 3810 | | | 4720 – 4875 | | |
| 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) | 830 – 965 | | | 1910 – 1990 | | |
| 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) | 660 – 825 | | | 4845 – 5060 | | |
| 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) | 2010 – 2200 | | | 5600 – 5790 | | |
| 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) | 4560 – 4725 | | | 6640 – 6855 | | |
| 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) | 6765 – 7040 | | | 1540 – 1740 | | |
| 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 – 4180 | | | 1095 – 1320 | | |
| 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) | 8560 – 8835 | | | 5440 – 5640 | | |
| 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) | 7520 – 7770 | | | 6480 – 6705 | | |

Based on Table 5.107.2-1,

- 2nd order harmonics may fall into Rx frequencies of bands 7, 41, 77 and 90

- 3rd order harmonics may fall into Rx frequencies of bands 3, 46 and 47

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

- 4th order IMD may fall into Rx frequencies of bands 1, 4, 10, 12, 13, 14, 17, 20, 23, 28, 29, 34, 44, 46, 65, 66, 67, 68, 70, 79, 79 and 85

- 5th order IMD may fall into Rx frequencies of bands 24, 46 and 77

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 5.107.2-2 lists if up to 3rd order harmonics and IMD up to 5th order falls into one of these receiving bands.

Table 5.107.2-2: 2UL Band 8 + Band n1 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 | 3rd Harmonic, IMD4, IMD5 |
| 5150 | - | 5350 | No | Europe |  |
| 5470 | - | 5725 | Yes | IMD4, IMD5 |
| 5150 | - | 5825 | Yes | Asia | 3rd Harmonic, IMD4, IMD5 |

The requirements for spurious emission band UE coexistence exist for DC\_8\_n1 in 38101-3.

### 5.107.3 ∆TIB and ∆RIB values

Table 5.107.3-1: ΔTIB,c

| Inter-band DC Configuration | E-UTRA and NR Band | ΔTIB,c [dB] |
| --- | --- | --- |
| DC\_8A-32A\_n1 | 8 | 0.3 |
| 32 | N/A |
| n1 | 0.5 |

**Table 5.107.3-2: ΔRIB**

| Inter-band DC Configuration | E-UTRA and NR Band | ΔRIB [dB] |
| --- | --- | --- |
| DC\_8A-32A\_n1 | 8 | 0 |
| 32 | 0 |
| n1 | 0 |

### 5.107.4 Reference sensitivity exceptions

## No additional IMD exceptions required compared to fallbacks.5.108 DC\_12-66\_n41

5.108.1 Operating bands for EN-DC

Table 5.108.1-1: Band combinations EN-DC (three bands)

| EN-DC band | E-UTRA CA band | NR band | Single UL allowed |
| --- | --- | --- | --- |
| 12-66\_n41 | CA\_12-66 | n41 |  |

### 5.108.2 Configuration for DC

Table 5.108.2-1: Inter-band EN-DC configurations (three bands)

| EN-DC  configuration | Uplink EN-DC  configuration  (NOTE 1) | E-UTRA CA configuration | NR band |
| --- | --- | --- | --- |
| DC\_12A-66A\_n41A | DC\_12A\_n41A DC\_66A\_n41A | CA\_12A-66A | n41A |

5.108.3 ∆TIB and ∆RIB values

For DC\_12-66\_n41, the ΔTIB,c and ΔRIB,c values are reused from DC\_66\_n41-n71 and are given in the tables below.

**Table 5.108.3-1: ΔTIB,c**

| Inter-band DC Configuration | E-UTRA and NR Band | ΔTIB,c [dB] |
| --- | --- | --- |
| DC\_12-66\_n41 | 12 | 0.6 |
| 66 | 0.5 |
| n41 | 0.81 |
| 1.32 |
| 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 5.108.3-2: ΔRIB**

| Inter-band DC Configuration | E-UTRA and NR Band | ΔTIB,c [dB] |
| --- | --- | --- |
| DC\_12-66\_n41 | 12 | 0.5 |
| 66 | 0.5 |
| n41 | 0.51 |
| 12 |
| 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. | | |

5.108.4 REFSENS requirements

There is IMD2 impact from UL 66\_n41 affecting DL band 12. The MSD value is derived from DC\_7A-13A\_n66A.

The IMD3 impact from UL 66\_n41 affecting DL band 12 is too close to the band edges to allocate test points and can therefore be disregarded.

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\_12A-66A\_n41A | 12 | 712 | 5 | 25 | 742 | 31 | IMD2 |
| 66 | 1773 | 5 | 25 | 2173 | N/A | N/A |
| n41 | 2515 | 5 | 25 | 2515 | N/A | N/A |

## 5.109 DC\_2-12\_n41

5.109.1 Operating bands for EN-DC

Table 5.109.1-1: Band combinations EN-DC (three bands)

| EN-DC band | E-UTRA CA band | NR band | Single UL allowed |
| --- | --- | --- | --- |
| 2-12\_n41 | CA\_2-12 | n41 |  |

### 5.109.2 Configuration for DC

Table 5.109.2-1: Inter-band EN-DC configurations (three bands)

| EN-DC  configuration | Uplink EN-DC  configuration  (NOTE 1) | E-UTRA CA configuration | NR band |
| --- | --- | --- | --- |
| DC\_2A-12A\_n41A | DC\_2A\_n41A DC\_12A\_n41A | CA\_2A-12A | n41A |
| DC\_2A-2A-12A\_n41A | DC\_2A\_n41A DC\_12A\_n41A | CA\_2A-2A-12A | n41A |

5.109.3 ∆TIB and ∆RIB values

For DC\_2-12\_n41, the ΔTIB,c and ΔRIB,c values are reused from CA\_2-7-12 and DC\_2\_n41-n71 and are given in the tables below.

**Table 5.109.3-1: ΔTIB,c**

| Inter-band DC Configuration | E-UTRA and NR Band | ΔTIB,c [dB] |
| --- | --- | --- |
| DC\_2-12\_n41 DC\_2-2-12\_n41 | 2 | 0.5 |
| 12 | 0.3 |
| n41 | 0.5 |

**Table 5.109.3-2: ΔRIB**

| Inter-band DC Configuration | E-UTRA and NR Band | ΔTIB,c [dB] |
| --- | --- | --- |
| DC\_2-12\_n41  DC\_2-2-12\_n41 | 2 | 0 |
| 12 | 0 |
| n41 | 0 |

5.109.4 REFSENS requirements

There are IMD2 impact from UL 12\_n41 affecting DL band 2. The IMD2 MSD value is derived from DC\_2A-71A\_n38A.

There are IMD2 and IMD5 impact from UL 2\_n41 affecting DL band 12. The IMD2 MSD value is derived from DC\_2A\_n41A-n71A.

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\_2A-12A\_n41A DC\_2A-2A-12A\_n41A | 2 | 1872 | 5 | 25 | 1952 | 26 | IMD2 |
| 12 | 708 | 5 | 50 | 738 | N/A | N/A |
| n41 | 2660 | 10 | 50 | 2660 | N/A | N/A |
| 2 | 1900 | 5 | 25 | 1980 | N/A | N/A |
| 12 | 708 | 5 | 50 | 738 | 28.7 | IMD24 |
| n41 | 2638 | 10 | 50 | 2638 | N/A | N/A |
| NOTE 4: This band is subject to IMD5 also which MSD is not specified | | | | | | | |

## 5.110 DC\_66-71\_n41

5.110.1 Operating bands for EN-DC

Table 5.110.1-1: Band combinations EN-DC (three bands)

| EN-DC band | E-UTRA CA band | NR band | Single UL allowed |
| --- | --- | --- | --- |
| 66-71\_n41 | CA\_66-71 | n41 |  |

### 5.110.2 Configuration for DC

Table 5.110.2-1: Inter-band EN-DC configurations (three bands)

| EN-DC  configuration | Uplink EN-DC  configuration  (NOTE 1) | E-UTRA CA configuration | NR band |
| --- | --- | --- | --- |
| DC\_66A-71A\_n41A | DC\_66A\_n41A DC\_71A\_n41A | CA\_66A-71A | n41A |

5.110.3 ∆TIB and ∆RIB values

For DC\_66-71\_n41, the ΔTIB,c and ΔRIB,c values are reused from DC\_66\_n41-n71 and are given in the tables below.

**Table 5.110.3-1: ΔTIB,c**

| Inter-band DC Configuration | E-UTRA and NR Band | ΔTIB,c [dB] |
| --- | --- | --- |
| DC\_66-71\_n41 | 66 | 0.5 |
| 71 | 0.6 |
| n41 | 0.81 |
| 1.32 |
| 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 5.110.3-2: ΔRIB**

| Inter-band DC Configuration | E-UTRA and NR Band | ΔTIB,c [dB] |
| --- | --- | --- |
| DC\_66-71\_n41 | 66 | 0.5 |
| 71 | 0.5 |
| n41 | 0.51 |
| 12 |
| 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. | | |

5.110.4 REFSENS requirements

There is no need to define MSD.

## 5.111 DC\_2-71\_n41

5.111.1 Operating bands for EN-DC

Table 5.111.1-1: Band combinations EN-DC (three bands)

| EN-DC band | E-UTRA CA band | NR band | Single UL allowed |
| --- | --- | --- | --- |
| 2-71\_n41 | CA\_2-71 | n41 |  |

### 5.111.2 Configuration for DC

Table 5.111.2-1: Inter-band EN-DC configurations (three bands)

| EN-DC  configuration | Uplink EN-DC  configuration  (NOTE 1) | E-UTRA CA configuration | NR band |
| --- | --- | --- | --- |
| DC\_2A-71A\_n41A | DC\_2A\_n41A DC\_71A\_n41A | CA\_2A-71A | n41A |
| DC\_2A-2A-71A\_n41A | DC\_2A\_n41A DC\_71A\_n41A | CA\_2A-2A-71A | n41A |

5.111.3 ∆TIB and ∆RIB values

For DC\_2-71\_n41, the ΔTIB,c and ΔRIB,c values are reused from DC\_2\_n41-n71 and are given in the tables below.

**Table 5.111.3-1: ΔTIB,c**

| Inter-band DC Configuration | E-UTRA and NR Band | ΔTIB,c [dB] |
| --- | --- | --- |
| DC\_2-71\_n41 DC\_2-2-71\_n41 | 2 | 0.5 |
| 71 | 0.3 |
| n41 | 0.5 |

**Table 5.111.3-2: ΔRIB**

| Inter-band DC Configuration | E-UTRA and NR Band | ΔTIB,c [dB] |
| --- | --- | --- |
| DC\_2-71\_n41  DC\_2-2-71\_n41 | 2 | 0 |
| 71 | 0 |
| n41 | 0 |

5.111.4 REFSENS requirements

There are IMD2 impact from UL 71\_n41 affecting DL band 2. The IMD2 MSD value is derived from DC\_2A-71A\_n38A.

There are IMD2 and IMD5 impact from UL 2\_n41 affecting DL band 71. The IMD2 MSD value is derived from DC\_2A\_n41A-n71A.

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\_2A-71A\_n41A DC\_2A-2A-71A\_n41A | 2 | 1862 | 5 | 25 | 1942 | 26 | IMD2 |
| 71 | 668 | 5 | 25 | 622 | N/A | N/A |
| n41 | 2610 | 10 | 50 | 2610 | N/A | N/A |
| 2 | 1900 | 5 | 25 | 1980 | N/A | N/A |
| 71 | 676 | 5 | 50 | 630 | 28.7 | IMD24 |
| n41 | 2530 | 10 | 50 | 2530 | N/A | N/A |
| NOTE 4: This band is subject to IMD5 also which MSD is not specified | | | | | | | |

## 5.112 DC\_7-12\_n66

5.112.1 Operating bands for EN-DC

Table 5.112.1-1: Band combinations EN-DC (three bands)

| EN-DC band | E-UTRA CA band | NR band | Single UL allowed |
| --- | --- | --- | --- |
| 7-12\_n66 | CA\_7-12 | n66 |  |

### 5.112.2 Configuration for DC

Table 5.112.2-1: Inter-band EN-DC configurations (three bands)

| EN-DC  Configuration | Uplink EN-DC  configuration  (NOTE 1) | E-UTRA CA configuration | NR band |
| --- | --- | --- | --- |
| DC\_7A-12A\_n66A | DC\_7A\_n66A DC\_12A\_n66A | CA\_7A-12A | n66A |

5.112.3 ∆TIB and ∆RIB values

For DC\_7-12\_n66, the ΔTIB,c and ΔRIB,c values are reused from DC\_7-66\_n71 and are given in the tables below.

**Table 5.112.3-1: ΔTIB,c**

| Inter-band DC Configuration | E-UTRA and NR Band | ΔTIB,c [dB] |
| --- | --- | --- |
| DC\_7-12\_n66 | 7 | 0.5 |
| 12 | 0.5 |
| n66 | 0.5 |

**Table 5.112.3-2: ΔRIB**

| Inter-band DC Configuration | E-UTRA and NR Band | ΔRIB [dB] |
| --- | --- | --- |
| DC\_7-12\_n66 | 7 | 0.5 |
| 12 | 0.1 |
| n66 | 0.5 |

5.112.4 REFSENS requirements

There are IMD2 impact from UL 7\_n66 affecting DL band 12. The IMD2 MSD value is derived from DC\_7A-13A\_n66A.

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-12A\_n66A | 7 | 2515 | 5 | 25 | 2635 | N/A | N/A |
| 12 | 712 | 5 | 25 | 742 | 31 | IMD2 |
| n66 | 1773 | 5 | 25 | 2173 | N/A | N/A |

## 5.113 DC\_7-71\_n66

5.113.1 Operating bands for EN-DC

Table 5.113.1-1: Band combinations EN-DC (three bands)

| EN-DC band | E-UTRA CA band | NR band | Single UL allowed |
| --- | --- | --- | --- |
| 7-71\_n66 | CA\_7-71 | n66 |  |

### 5.113.2 Configuration for DC

Table 5.113.2-1: Inter-band EN-DC configurations (three bands)

| EN-DC  configuration | Uplink EN-DC  configuration  (NOTE 1) | E-UTRA CA configuration | NR band |
| --- | --- | --- | --- |
| DC\_7A-71A\_n66A | DC\_7A\_n66A DC\_71A\_n66A | CA\_7A-71A | n71A |

5.113.3 ∆TIB and ∆RIB values

For DC\_7-71\_n66, the ΔTIB,c and ΔRIB,c values are reused from DC\_7-66\_n71 and are given in the tables below.

**Table 5.113.3-1: ΔTIB,c**

| Inter-band DC Configuration | E-UTRA and NR Band | ΔTIB,c [dB] |
| --- | --- | --- |
| DC\_7-71\_n66 | 7 | 0.5 |
| 71 | 0.5 |
| n66 | 0.5 |

**Table 5.113.3-2: ΔRIB**

| Inter-band DC Configuration | E-UTRA and NR Band | ΔRIB [dB] |
| --- | --- | --- |
| DC\_7-71\_n66 | 7 | 0.5 |
| 71 | 0.1 |
| n66 | 0.5 |

5.113.4 REFSENS requirements

There is no need to define MSD.

## 5.114 DC\_7-12\_n78

5.114.1 Operating bands for EN-DC

Table 5.114.1-1: Band combinations EN-DC (three bands)

| EN-DC band | E-UTRA CA band | NR band | Single UL allowed |
| --- | --- | --- | --- |
| 7-12\_n78 | CA\_7-12 | n78 |  |

### 5.114.2 Configuration for DC

Table 5.114.2-1: Inter-band EN-DC configurations (three bands)

| EN-DC  Configuration | Uplink EN-DC  configuration  (NOTE 1) | E-UTRA CA configuration | NR band |
| --- | --- | --- | --- |
| DC\_7A-12A\_n78A | DC\_7A\_n78A DC\_12A\_n78A | CA\_7A-12A | n78A |

5.114.3 ∆TIB and ∆RIB values

For DC\_7-12\_n78, the ΔTIB,c and ΔRIB,c values are reused from DC\_12\_n7-n78 and are given in the tables below.

**Table 5.114.3-1: ΔTIB,c**

| Inter-band DC Configuration | E-UTRA and NR Band | ΔTIB,c [dB] |
| --- | --- | --- |
| DC\_7-12\_n78 | 7 | 0.5 |
| 12 | 0.5 |
| n78 | 0.8 |

**Table 5.114.3-2: ΔRIB**

| Inter-band DC Configuration | E-UTRA and NR Band | ΔRIB [dB] |
| --- | --- | --- |
| DC\_7-12\_n78 | 7 | 0.2 |
| 12 | 0.5 |
| n78 | 0.5 |

5.114.4 REFSENS requirements

There are IMD2 impact from UL 12\_n78 affecting DL band 7. The IMD2 MSD value is derived from DC\_12A\_n7A-n78A.

There are IMD2 and IMD5 impact from UL 7\_n78 affecting DL band 12. The IMD2 MSD value is derived from DC\_28A-41A\_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-12A\_n78A | 7 | 2542 | 5 | 25 | 2662 | 29.6 | IMD2 |
| 12 | 708 | 5 | 25 | 738 | N/A | N/A |
| n78 | 3370 | 10 | 50 | 3370 | N/A | N/A |
| 7 | 2565 | 5 | 25 | 2685 | N/A | N/A |
| 12 | 710 | 5 | 25 | 740 | 30.8 | IMD24 |
| n78 | 3305 | 10 | 50 | 3305 | N/A | N/A |
| NOTE 4: This band is subject to IMD5 also which MSD is not specified | | | | | | | |

## 5.115 DC\_12-66\_n78

5.115.1 Operating bands for EN-DC

Table 5.115.1-1: Band combinations EN-DC (three bands)

| EN-DC band | E-UTRA CA band | NR band | Single UL allowed |
| --- | --- | --- | --- |
| 12-66\_n78 | CA\_12-66 | n78 |  |

### 5.115.2 Configuration for DC

Table 5.115.2-1: Inter-band EN-DC configurations (three bands)

| EN-DC  Configuration | Uplink EN-DC  configuration  (NOTE 1) | E-UTRA CA configuration | NR band |
| --- | --- | --- | --- |
| DC\_12A-66A\_n78A | DC\_12A\_n78A DC\_66A\_n78A | CA\_12A-66A | n78A |

5.115.3 ∆TIB and ∆RIB values

For DC\_12-66\_n78, the ΔTIB,c and ΔRIB,c values are reused from DC\_66-71\_n78 and are given in the tables below.

**Table 5.115.3-1: ΔTIB,c**

| Inter-band DC Configuration | E-UTRA and NR Band | ΔTIB,c [dB] |
| --- | --- | --- |
| DC\_12-66\_n78 | 12 | 0.6 |
| 66 | 0.6 |
| n78 | 0.8 |

**Table 5.115.3-2: ΔRIB**

| Inter-band DC Configuration | E-UTRA and NR Band | ΔRIB [dB] |
| --- | --- | --- |
| DC\_12-66\_n78 | 12 | 0.2 |
| 66 | 0.2 |
| n78 | 0.5 |

5.115.4 REFSENS requirements

There are IMD3 impact from UL 12\_n78 affecting DL band 66. The IMD3 MSD value is derived from DC\_48A-66A\_n12A.

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\_12A-66A\_n78A | 12 | 710 | 5 | 25 | 740 | N/A | N/A |
| 66 | 1760 | 5 | 25 | 2160 | 17.1 | IMD3 |
| n78 | 3580 | 5 | 25 | 3580 | N/A | N/A |

## 5.116 DC\_2-12\_n78

5.116.1 Operating bands for EN-DC

Table 5.116.1-1: Band combinations EN-DC (three bands)

| EN-DC band | E-UTRA CA band | NR band | Single UL allowed |
| --- | --- | --- | --- |
| 2-12\_n78 | CA\_2-12 | n78 |  |

### 5.116.2 Configuration for DC

Table 5.116.2-1: Inter-band EN-DC configurations (three bands)

| EN-DC  Configuration | Uplink EN-DC  configuration  (NOTE 1) | E-UTRA CA configuration | NR band |
| --- | --- | --- | --- |
| DC\_2A-12A\_n78A | DC\_2A\_n78A DC\_12A\_n78A | CA\_2A-12A | n78A |
| DC\_2A-2A-12A\_78A | DC\_2A\_n78A DC\_12A\_n78A | CA\_2A-2A-12A | n78A |

5.116.3 ∆TIB and ∆RIB values

For DC\_2-12\_n78, the ΔTIB,c and ΔRIB,c values are reused from DC\_2-71\_n78 and are given in the tables below.

**Table 5.116.3-1: ΔTIB,c**

| Inter-band DC Configuration | E-UTRA and NR Band | ΔTIB,c [dB] |
| --- | --- | --- |
| DC\_2-12\_n78 | 2 | 0.6 |
| 12 | 0.6 |
| n78 | 0.8 |

**Table 5.116.3-2: ΔRIB**

| Inter-band DC Configuration | E-UTRA and NR Band | ΔRIB [dB] |
| --- | --- | --- |
| DC\_2-12\_n78 | 2 | 0.2 |
| 12 | 0.2 |
| n78 | 0.5 |

5.116.4 REFSENS requirements

There are IMD3 impact from UL 12\_n78 affecting DL band 2. The IMD3 MSD value is derived from DC\_2A-71A\_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\_2A-12A\_n78A DC\_2A-2A-12A\_n78A | 2 | 1874 | 5 | 25 | 1954 | 16.5 | IMD3 |
| 12 | 708 | 5 | 25 | 738 | N/A | N/A |
| n78 | 3370 | 10 | 50 | 3370 | N/A | N/A |

## 5.117 DC\_7-71\_n78

5.117.1 Operating bands for EN-DC

Table 5.117.1-1: Band combinations EN-DC (three bands)

| EN-DC band | E-UTRA CA band | NR band | Single UL allowed |
| --- | --- | --- | --- |
| 7-71\_n78 | CA\_7-71 | n78 |  |

### 5.117.2 Configuration for DC

Table 5.117.2-1: Inter-band EN-DC configurations (three bands)

| EN-DC  Configuration | Uplink EN-DC  configuration  (NOTE 1) | E-UTRA CA configuration | NR band |
| --- | --- | --- | --- |
| DC\_7A-71A\_n78A | DC\_7A\_n78A DC\_71A\_n78A | CA\_7A-71A | n78A |

5.117.3 ∆TIB and ∆RIB values

For DC\_7-71\_n78, the ΔTIB,c and ΔRIB,c values are reused from DC\_12\_n7-n78 and are given in the tables below.

**Table 5.117.3-1: ΔTIB,c**

| Inter-band DC Configuration | E-UTRA and NR Band | ΔTIB,c [dB] |
| --- | --- | --- |
| DC\_7-71\_n78 | 7 | 0.5 |
| 71 | 0.5 |
| n78 | 0.8 |

**Table 5.117.3-2: ΔRIB**

| Inter-band DC Configuration | E-UTRA and NR Band | ΔRIB [dB] |
| --- | --- | --- |
| DC\_7-71\_n78 | 7 | 0.2 |
| 71 | 0.5 |
| n78 | 0.5 |

5.117.4 REFSENS requirements

There are IMD2 impact from UL 71\_n78 affecting DL band 7. The IMD2 MSD value is derived from DC\_12A\_n7A-n78A.

There are IMD5 impact from UL 7\_n78 affecting DL band 71. The IMD2 MSD value is derived from DC\_28A-41A\_n77A.

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-71A\_n78A | 7 | 2550 | 5 | 25 | 2670 | 29.6 | IMD2 |
| 71 | 680 | 5 | 25 | 634 | N/A | N/A |
| n78 | 3350 | 10 | 50 | 3350 | N/A | N/A |
| 7 | 2540 | 5 | 25 | 2660 | N/A | N/A |
| 71 | 686 | 5 | 25 | 640 | 3.0 | IMD5 |
| n78 | 3490 | 10 | 50 | 3490 | N/A | N/A |

Annex A (informative):  
Change history

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Change history** | | | | | | | |
| **Date** | **Meeting** | **TDoc** | **CR** | **Rev** | **Cat** | **Subject/Comment** | **New version** |
| 2020-8 | 3GPP RAN4#96-e |  |  |  |  | TR skeleton | 0.0.1 |
| 2020-8 | 3GPP RAN4#96-e | R4-2011889 |  |  |  | The following approved TPs at RAN4#96-e have been implemented:  R4-2011584 TP for TR 37.717-21-11: DC\_1-32\_n28  R4-2011585 TP for TR 37.717-21-11: DC\_7-32\_n28  R4-2009716 TP for TR 37.717-21-11: DC\_7-32\_n78  R4-2011586 TP for TR 37.717-21-11: DC\_20-32\_n28  R4-2010232 TP for TR 37.717.21-11: DC\_2A-48A\_n5A  R4-2010233 TP for TR 37.717.21-11: DC\_5A-48A\_n12A  R4-2010234 TP for TR 37.717.21-11: DC\_5A-48A\_n71A  R4-2010235 TP for TR 37.717.21-11: DC\_12A-48A\_n5A  R4-2010245 TP for TR 37.717-21-11 DC\_3A\_(n)41AA  R4-2011605 TP for 37.717-21-11 to introduce DC\_2A-48A\_n48A  R4-2011607 TP for 37.717-21-11 to introduce DC\_48-66A\_n25A  R4-2010410 TP for 37.717-21-11 to introduce DC\_48A-66A\_n48A  R4-2011608 TP for 37.717-21-11 to introduce DC\_3A-8A\_n40A  R4-2011609 TP for 37.717-21-11 to introduce DC\_3A-28A\_n1A  R4-2010421 TP for 37.717-21-11 to introduce DC\_7A-8A\_n40A  R4-2011610 TP for 37.717-21-11 to introduce DC\_7A-28A\_n1A  R4-2010439 TP for DC\_3-19\_n1 for TR 37.717-21-11  R4-2011612 TP for DC\_3-21\_n1 for TR 37.717-21-11  R4-2010453 TP for DC\_3-42\_n1 for TR 37.717-21-11  R4-2010454 TP for DC\_19-21\_n1 for TR 37.717-21-11  R4-2011613 TP for DC\_19-42\_n1 for TR 37.717-21-11  R4-2011614 TP for DC\_21-42\_n1 for TR 37.717-21-11  R4-2011616 TP for TR 37.717-21-11: DC\_7-66\_n5  R4-2010513 TP for TR 37.717-21-11: DC\_2-7\_n5  R4-2010556 TP to TR 37.717-21-11 DC\_1A-40A\_n78A  R4-2010557 TP to TR 37.717-21-11 DC\_3A-40A\_n78A  R4-2010558 TP to TR 37.717-21-11 DC\_7A-40A\_n78A  R4-2011618 TP to TR 37.717-21-11 DC\_8A-40A\_n78A  R4-2011620 TP for TR 37.717-21-11 to include DC\_2A-12A\_n5A  R4-2011621 TP for TR 37.717-21-11 to include DC\_2A-5A\_n12A  R4-2010699 TP for TR 37.717-21-11 to include DC\_5A-66A\_n12A  R4-2010700 TP for TR 37.717-21-11 to include DC\_66A\_(n)5AA  R4-2010701 TP for TR 37.717-21-11 to include DC\_12A-66A\_n5A  R4-2010883 TP for TR 37.717-21-11: DC\_7A-8A\_n28A  R4-2010884 TP for TR 37.717-21-11: DC\_20A-28A\_n3A  R4-2010885 TP for TR 37.717-21-11: DC\_28A-66A\_n66A  R4-2010886 TP for TR 37.717-21-11: DC\_7A-28A\_n66A / DC\_7C-28A\_n66A  R4-2010887 TP for TR 37.717-21-11: DC\_2A-28A\_n66A  R4-2010888 TP for TR 37.717-21-11: DC\_3A-28A\_n1A  R4-2010889 TP for TR 37.717-21-11: DC\_7A-28A\_n1A  R4-2010890 TP for TR 37.717-21-11: DC\_8A-40A\_n1A / DC\_8A-40C\_n1A  R4-2010894 TP for TR 37.717-21-11: DC\_1A-32A\_n3A  R4-2010895 TP for TR 37.717-21-11: DC\_3A-32A\_n1A  R4-2009924 TP for TR 37.717-21-11 for DC\_2A-4A\_n28A  R4-2009925 TP for TR 37.717-21-11 for DC\_2A-7A\_n28A  R4-2009926 TP for TR 37.717-21-11 for DC\_2A-66A\_n28A  R4-2009927 TP for TR 37.717-21-11 for DC\_4A-7A\_n28A  R4-2009928 TP for TR 37.717-21-11 for DC\_5-7\_n66  R4-2009929 TP for TR 37.717-21-11 for DC\_7A-66A\_n28A  R4-2009992 TP for TR 37.717-21-11: EN-DC\_1-11\_n28  R4-2009993 TP for TR 37.716-21-11: EN-DC\_3-11\_n28  R4-2009994 TP for TR 37.717-21-11: EN-DC\_8-11\_n28  R4-2011593 TP for TR 37.717-21-11: EN-DC\_3-11\_n77 | 0.1.0 |
| 2020-11 | 3GPP RAN4#97-e | R4-2015704 |  |  |  | The following approved TPs at RAN4#97-e have been implemented:  R4-2014056 TP for TR 37.717-21-11: DC\_7-32\_n78  R4-2014057 TP for TR 37.717-21-11: DC\_7-32\_n1  R4-2014031 TP for 37.717-21-11 for DC\_2-66\_n7  R4-2014032 TP for 37.717-21-11 for DC\_2-5\_n7  R4-2014033 TP for 37.717-21-11 for DC\_2-8\_n2  R4-2014034 TP for 37.717-21-11 for DC\_5-66\_n7  R4-2016656 TP for 37.717-21-11 for DC\_20-32\_n1  R4-2014036 TP for 37.717-21-11 for DC\_20-32\_n3  R4-2014103 TP for TR 37.717-21-11 DC\_1-3\_n3  R4-2014104 TP for TR 37.717-21-11 DC\_1-41\_n3  R4-2014105 TP for TR 37.717-21-11 DC\_3-18\_n3  R4-2014106 TP for TR 37.717-21-11 DC\_3-41\_n3  R4-2014128 TP for TR 37.717-21-11 DC\_5A-7A\_n66A  R4-2014129 TP for TR 37.717-21-11 DC\_7-66\_n77  R4-2014132 TP for TR 37.717-21-11 DC\_2-5\_n48  R4-2014133 TP for TR 37.717-21-11 DC\_2-13\_n48  R4-2014135 TP for TR 37.717-21-11 DC\_2-48\_n5  R4-2014136 TP for TR 37.717-21-11 DC\_5-46\_n66  R4-2014137 TP for TR 37.717-21-11 DC\_5-66\_n48  R4-2014138 TP for TR 37.717-21-11 DC\_5-66\_n77  R4-2014612 TP for TR 37.717-21-11: EN-DC\_1-42\_n3  R4-2014613 TP for TR 37.717-21-11: EN-DC\_8-42\_n3  R4-2016662 TP update for TR 37.717-21-11: EN-DC\_1-11\_n28  R4-2014811 TP for DC\_3-18\_n28  R4-2014852 TP for TR 37.717-21-11: CA\_2-66\_n77  R4-2014854 TP for TR 37.717-21-11: CA\_2-48\_n77  R4-2014856 TP for TR 37.717-21-11: CA\_2-13\_n77  R4-2014857 TP for TR 37.717-21-11: CA\_2-5\_n77  R4-2014858 TP for TR 37.717-21-11: CA\_5-13\_n66  R4-2014860 TP for TR 37.717-21-11: CA\_13-66\_n77  R4-2014862 TP for TR 37.717-21-11: CA\_13-66\_n5  R4-2016664 TP for DC\_1-18\_n28  R4-2016665 TP for DC\_1-18\_n41  R4-2014982 TP for DC\_3-42\_n1 for TR 37.717-21-11  R4-2016668 TP for 37.717-21-11 to introduce DC\_5A-7A\_n7A  R4-2015226 TP for 37.717-21-11 to introduce DC\_2A-28A\_n7A  R4-2016669 TP for 37.717-21-11 to introduce DC\_28A-66A\_n7A  R4-2015228 TP for 37.717-21-11 to introduce DC\_7A-28A\_n2A  R4-2015229 TP for 37.717-21-11 to introduce DC\_2A-7A\_n7A  R4-2015246 TP for 37.717-21-11 to introduce DC\_2A-71A\_n71A and DC\_66A-71A\_n71A  R4-2015268 TP to TR 37.717-21-11 DC\_1A-40C\_n78A  R4-2015269 TP to TR 37.717-21-11 DC\_3A-40C\_n78A  R4-2015270 TP to TR 37.717-21-11 DC\_7A-40C\_n78A  R4-2015271 TP to TR 37.717-21-11 DC\_8A-40C\_n78A  R4-2015404 TP for TR 37.717-21-11: DC\_7A-66A\_n7A/DC\_7A-66A-66A\_n7A  R4-2015710 TP for TR 37.717-21-11: DC\_2-7\_n77  R4-2015711 TP for TR 37.717-21-11: DC\_7-66\_n77 | 0.2.0 |
| 2021-02 | 3GPP RAN4#98-e | R4-2101508 |  |  |  | The following approved TPs at RAN4#98-e have been implemented:  R4-2103006 TP to TR 37.717-21-11: DC\_20-40\_n78  R4-2103010 TP for TR 37.717-21-11: DC\_3-18\_n41  R4-2103011 TP update for TR 37.717-21-11: EN-DC\_1-11\_n28  R4-2103014 TP to TR 37.717-21-11 DC\_7-25\_n77  R4-2103015 TP to TR 37.717-21-11 DC\_7-25\_n78  R4-2103016 TP to TR 37.717-21-11 DC\_25-66\_n77  R4-2103017 TP to TR 37.717-21-11 DC\_25-66\_n78  R4-2103018 TP for TR 37.717-21-11: DC\_2-29\_n78  R4-2103019 TP for TR 37.717-21-11: DC\_29-66\_n78  R4-2103022 TP for DC\_1-21\_n28 for TR 37.717-21-11  R4-2101231 TP for DC\_3-21\_n28 for TR 37.717-21-11  R4-2101511 TP for 37.717-21-11: correction of duplicated TPS for some combinations  R4-2103023 TP for TR 37.717-21-11: DC\_8-20\_n1  R4-2103024 TP for TR 37.717-21-11: DC\_8-20\_n3  R4-2101548 TP for TR 37.717-21-11: DC\_8-32\_n1  R4-2101913 TP for TR 37.717-21-11 to include 12A-66A\_n41A  R4-2101914 TP for TR 37.717-21-11 to include 2A-12A\_n41A, 2A-2A-12A\_n41A  R4-2101915 TP for TR 37.717-21-11 to include 66A-71A\_n41A  R4-2101916 TP for TR 37.717-21-11 to include 2A-71A\_n41A, 2A-2A-71A\_n41A  R4-2101917 TP for TR 37.717-21-11 to include 7A-12A\_n66A  R4-2101918 TP for TR 37.717-21-11 to include 7A-71A\_n66A  R4-2101919 TP for TR 37.717-21-11 to include 7A-12A\_n78A  R4-2101920 TP for TR 37.717-21-11 to include 12A-66A\_n78A  R4-2101921 TP for TR 37.717-21-11 to include 2A-12A\_78A, 2A-2A-12A\_78A  R4-2102050 TP for TR 37.717-21-11 to include 7A-71A\_n78A | 0.3.0 |