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| 3GPP TR 37.827 V0.2.0 (2021-08) | |
| Technical Report | |
| 3rd Generation Partnership Project;  Technical Specification Group Radio Access Networks;  Power Class 2 for EN-DC with xLTE band + yNR DL with 1LTE+1(TDD) NR UL band (x= 2, 3, 4, y=1; x=1, 2, y=2).  (Release 17) | |
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| ***3GPP***  Postal address  3GPP support office address  650 Route des Lucioles - Sophia Antipolis  Valbonne - FRANCE  Tel.: +33 4 92 94 42 00 Fax: +33 4 93 65 47 16  Internet  http://www.3gpp.org |
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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 Power Class 2 for EN-DC with xLTE band + yNR DL with 1LTE+1(TDD) NR UL band (x= 2, 3, 4, y=1; x=1, 2, y=2) under Rel-17 time frame. The purpose is to gather the relevant background information and studies in order to address relevant requirements for the Rel-17 EN-DC band combinations with Power Class 2 requested by proponents and captured in the WID...

# 2 References

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

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

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

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

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

[2] RP-210816, “New WID on PC2 EN-DC with x LTE band + y NR band (x= 2, 3, 4, y=1; x=1, 2, y=2)”, RAN#91-e

# 3 Definitions of terms, symbols and abbreviations

## 3.1 Terms

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

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

## 3.2 Symbols

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

<symbol> <Explanation>

## 3.3 Abbreviations

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

<ABBREVIATION> <Expansion>

# 4 Background

The present document is a technical report for Power Class 2 band combinations 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 EN-DC Power Class 2: Specific Band Combination Part

## 5.1 DC\_2A-5A\_n77A

### 5.1.1 Transmitter Characteristics

#### 5.1.1.1 Maximum Output Power

Table 5.1.1.1-1: Maximum output power for inter-band EN-DC (two bands)

| **EN-DC combination** | Power class 2 (dBm) | Tolerance (dB) |
| --- | --- | --- |
| DC\_2A\_n77A | 266 | +2/-3 |
| DC\_5A\_n77A | 266 | +2/-3 |
| NOTE 6: The UE supports PC3 within E-UTRA cell group, and supports either PC3 or PC2 within NR cell group. Power class support within each individual cell group is signalled separately by the UE. | | |

#### 

#### 5.1.1.2 Co-existence study

According to the PC3 DC\_2A-5A\_n77A study in 37.717-21-11, the Rx impacts are identified as below,

* 3rd order IMD products generated by DC\_2\_5 uplink may fall into own Rx of band n77.
* 5th order IMD products generated by DC\_2\_n77 uplink may fall into own Rx of band 5.

Thus, additional MSD for IMD 3 and 5 should be considered to mitigate the impact of the interference for PC2 DC\_2A-5A\_n77A combination.

### 5.1.2 Receiver Characteristics

#### 5.1.2.1 MSD test points for intermodulation interference due to dual uplink operation for PC2 EN-DC in NR FR1 involving two bands

#### 5.1.2.1.1 Power class 2 Case A

The additional MSD due to intermodulation for PC2 Case A DC\_2A-5A\_n77A are defined in table 5.1.2.2.1-1.

Table 5.1.2.1.1-1: MSD test points for PCell due to dual uplink operation for PC2 EN-DC in NR FR1 (three bands)

| NR or E-UTRA Band / Channel bandwidth / NRB / MSD | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- |
| EN-DC Configuration | EUTRA / NR band | UL Fc  (MHz) | UL/DL BW  (MHz) | UL  LCRB | DL Fc (MHz) | MSD  (dB) | IMD order |
| DC\_2A-5A\_n77A | 2 | 1907.5 | 5 | 25 | 1987.5 | N/A | N/A |
| 5 | 842.5 | 5 | 25 | 887.5 | 16.6 | IMD5 |
| n77 | 3305 | 5 | 25 | 3305 | N/A | N/A |
| 2 | 1907 | 5 | 25 | 1987 | 24.8 | IMD3 |
| 5 | 846.5 | 5 | 25 | 891.5 | N/A | N/A |
| n77 | 3680 | 5 | 25 | 3680 | N/A | N/A |

#### 5.1.2.1.2 Power class 2 Case B

The additional MSD due to intermodulation for PC2 Case B DC\_2A-5A\_n77A are the same as the Case A defined in table 5.1.2.1.1-1.

## 5.2 DC\_2A-13A\_n77A

### 5.2.1 Transmitter Characteristics

#### 5.2.1.1 Maximum Output Power

Table 5.2.1.1-1: Maximum output power for inter-band EN-DC (two bands)

| **EN-DC combination** | Power class 2 (dBm) | Tolerance (dB) |
| --- | --- | --- |
| DC\_2A\_n77A | 266 | +2/-3 |
| DC\_13A\_n77A | 266 | +2/-3 |
| NOTE 6: The UE supports PC3 within E-UTRA cell group, and supports either PC3 or PC2 within NR cell group. Power class support within each individual cell group is signalled separately by the UE. | | |

#### 5.2.1.2 Co-existence study

According to the PC3 DC\_2A-13A\_n77A study in 37.717-21-11, the Rx impacts are identified as below,

* 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

Thus, additional MSD for IMD 3 should be considered to mitigate the impact of the interference for PC2 DC\_2A-13A\_n77A combination.

### 5.2.2 Receiver Characteristics

#### 5.2.2.1 MSD test points for intermodulation interference due to dual uplink operation for PC2 EN-DC in NR FR1 involving two bands

#### 5.2.2.1.1 Power class 2 Case A

The additional MSD due to intermodulation for PC2 Case A DC\_2A-13A\_n77A are defined in table 5.2.2.2.1-1.

Table 5.2.2.1.1-1: MSD test points for PCell due to dual uplink operation for PC2 EN-DC in NR FR1 (three bands)

| NR or E-UTRA Band / Channel bandwidth / NRB / MSD | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- |
| EN-DC Configuration | EUTRA / NR band | UL Fc  (MHz) | UL/DL BW  (MHz) | UL  LCRB | DL Fc (MHz) | MSD  (dB) | IMD order |
| DC\_2A-13A\_n77A | 2 | 1864 | 5 | 25 | 1944 | 24.2 | IMD3 |
| 13 | 783 | 5 | 25 | 752 | N/A | N/A |
| n77 | 3510 | 5 | 25 | 3510 | N/A | N/A |

#### 5.2.2.1.2 Power class 2 Case B

The additional MSD due to intermodulation for PC2 Case B DC\_2A-13A\_n77A are the same as the Case A defined in table 5.2.2.1.1-1.

## 5.3 DC\_2A-66A\_n77A

### 5.3.1 Transmitter Characteristics

#### 5.3.1.1 Maximum Output Power

Table 5.3.1.1-1: Maximum output power for inter-band EN-DC (two bands)

| **EN-DC combination** | Power class 2 (dBm) | Tolerance (dB) |
| --- | --- | --- |
| DC\_2A\_n77A | 266 | +2/-3 |
| DC\_66A\_n77A | 266 | +2/-3 |
| NOTE 6: The UE supports PC3 within E-UTRA cell group, and supports either PC3 or PC2 within NR cell group. Power class support within each individual cell group is signalled separately by the UE. | | |

#### 5.3.1.2 Co-existence study

According to the PC3 DC\_2A-66A\_n77A study in 37.717-21-11, the Rx impacts are 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

Thus, additional MSD for IMD 3 and 5 should be considered to mitigate the impact of the interference for PC2 DC\_2A-66A\_n77A combination.

### 5.3.2 Receiver Characteristics

#### 5.3.2.1 MSD test points for intermodulation interference due to dual uplink operation for PC2 EN-DC in NR FR1 involving two bands

#### 5.3.2.1.1 Power class 2 Case A

The additional MSD due to intermodulation for PC2 Case A DC\_2A-66A\_n77A are defined in table 5.3.2.2.1-1.

Table 5.3.2.1.1-1: MSD test points for PCell due to dual uplink operation for PC2 EN-DC in NR FR1 (three bands)

| NR or E-UTRA Band / Channel bandwidth / NRB / MSD | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- |
| EN-DC Configuration | EUTRA / NR band | UL Fc  (MHz) | UL/DL BW  (MHz) | UL  LCRB | DL Fc (MHz) | MSD  (dB) | IMD order |
| DC\_2A-66A\_n77A | 2 | 1855 | 5 | 25 | 1935 | N/A | N/A |
| 66 | 1765 | 5 | 25 | 2185 | 34.7 | IMD2 |
| n77 | 4040 | 5 | 25 | 4040 | N/A | N/A |
| 2 | 1905 | 5 | 25 | 1985 | M/A | N/A |
| 66 | 1720 | 5 | 25 | 2120 | 21.1 | IMD44 |
| n77 | 3595 | 5 | 25 | 3595 | N/A | N/A |
| 2 | 1880 | 5 | 25 | 1960 | 37.6 | IMD2 |
| 66 | 1740 | 5 | 25 | 2140 | N/A | N/A |
| n77 | 3700 | 5 | 25 | 3700 | N/A | N/A |
| 2 | 1860 | 5 | 25 | 1940 | 19.8 | IMD44 |
| 66 | 1775 | 5 | 25 | 2195 | N/A | N/A |
| n77 | 3385 | 5 | 25 | 3385 | N/A | N/A |
| NOTE 4: This band is subject to IMD5 also which MSD is not specified. | | | | | | | |

#### 5.3.2.1.2 Power class 2 Case B

The additional MSD due to intermodulation for PC2 Case B DC\_2A-66A\_n77A are the same as the Case A defined in table 5.3.2.1.1-1.

## 5.4 DC\_5A-66A\_n77A

### 5.4.1 Transmitter Characteristics

#### 5.4.1.1 Maximum Output Power

Table 5.4.1.1-1: Maximum output power for inter-band EN-DC (two bands)

| **EN-DC combination** | Power class 2 (dBm) | Tolerance (dB) |
| --- | --- | --- |
| DC\_5A\_n77A | 266 | +2/-3 |
| DC\_66A\_n77A | 266 | +2/-3 |
| NOTE 6: The UE supports PC3 within E-UTRA cell group, and supports either PC3 or PC2 within NR cell group. Power class support within each individual cell group is signalled separately by the UE. | | |

#### 5.4.1.2 Co-existence study

According to the PC3 DC\_5A-66A\_n77A study in 37.717-21-11, the Rx impacts are identified as below,

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

Thus, additional MSD for IMD 3 should be considered to mitigate the impact of the interference for PC2 DC\_5A-66A\_n77A combination.

### 5.4.2 Receiver Characteristics

#### 5.4.2.1 MSD test points for intermodulation interference due to dual uplink operation for PC2 EN-DC in NR FR1 involving two bands

#### 5.4.2.1.1 Power class 2 Case A

The additional MSD due to intermodulation for PC2 Case A DC\_5A-66A\_n77A are defined in table 5.4.2.2.1-1.

Table 5.4.2.1.1-1: MSD test points for PCell due to dual uplink operation for PC2 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 | 22.2 | IMD3 |
| n77 | 3795 | 10 | 50 | 3795 | N/A | N/A |

#### 5.4.2.1.2 Power class 2 Case B

The additional MSD due to intermodulation for PC2 Case B DC\_5A-66A\_n77A are the same as the Case A defined in table 5.4.2.1.1-1.

## 5.5 DC\_13A-66A\_n77A

### 5.5.1 Transmitter Characteristics

#### 5.5.1.1 Maximum Output Power

Table 5.5.1.1-1: Maximum output power for inter-band EN-DC (two bands)

| **EN-DC combination** | Power class 2 (dBm) | Tolerance (dB) |
| --- | --- | --- |
| DC\_13A\_n77A | 266 | +2/-3 |
| DC\_66A\_n77A | 266 | +2/-3 |
| NOTE 6: The UE supports PC3 within E-UTRA cell group, and supports either PC3 or PC2 within NR cell group. Power class support within each individual cell group is signalled separately by the UE. | | |

#### 5.5.1.2 Co-existence study

According to the PC3 DC\_13A-66A\_n77A study in 37.717-21-11, the Rx impacts are 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

Thus, additional MSD for IMD 3 should be considered to mitigate the impact of the interference for PC2 DC\_13A-66A\_n77A combination.

### 5.5.2 Receiver Characteristics

#### 5.5.2.1 MSD test points for intermodulation interference due to dual uplink operation for PC2 EN-DC in NR FR1 involving two bands

#### 5.5.2.1.1 Power class 2 Case A

The additional MSD due to intermodulation for PC2 Case A DC\_13A-66A\_n77A are defined in table 5.5.2.2.1-1.

Table 5.5.2.1.1-1: MSD test points for PCell due to dual uplink operation for PC2 EN-DC in NR FR1 (three bands)

| NR or E-UTRA Band / Channel bandwidth / NRB / MSD | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- |
| EN-DC Configuration | EUTRA / NR band | UL Fc  (MHz) | UL/DL BW  (MHz) | UL  LCRB | DL Fc (MHz) | MSD  (dB) | IMD order |
| DC\_13A-66A\_n77A | 13 | 777 | 5 | 25 | 746 | N/A | N/A |
| 66 | 1746 | 5 | 25 | 2146 | 25.3 | IMD3 |
| n77 | 3700 | 10 | 50 | 3700 | N/A | N/A |
| 13 | 781 | 5 | 25 | 750 | 23.4 | IMD3 |
| 66 | 1710 | 5 | 25 | 2110 | N/A | N/A |
| n77 | 4170 | 10 | 50 | 4170 | N/A | N/A |

#### 5.5.2.1.2 Power class 2 Case B

The additional MSD due to intermodulation for PC2 Case B DC\_13A-66A\_n77A are the same as the Case A defined in table 5.5.2.1.1-1.

## 5.6 DC\_2A\_n5A-n77A

### 5.6.1 Transmitter Characteristics

#### 5.6.1.1 Maximum Output Power

Table 5.6.1.1-1: Maximum output power for inter-band EN-DC (two bands)

| **EN-DC combination** | Power class 2 (dBm) | Tolerance (dB) |
| --- | --- | --- |
| DC\_2A\_n77A | 266 | +2/-3 |
| NOTE 6: The UE supports PC3 within E-UTRA cell group, and supports either PC3 or PC2 within NR cell group. Power class support within each individual cell group is signalled separately by the UE. | | |

#### 5.6.1.2 Co-existence study

According to the PC3 DC\_2A\_n5A-n77A study in 37.717-11-21, the Rx impacts are identified as below,

* 3rd and 5th order IMD generated by dual uplink of 2\_n5 may fall into own Rx of band n77.
* 5th order IMD generated by dual uplink of 2\_n77 may fall into own Rx of band n5.

Thus, additional MSD for IMD 3 and 5 should be considered to mitigate the impact of the interference for PC2 DC\_2A\_n5A-n77A combination.

### 5.6.2 Receiver Characteristics

#### 5.6.2.1 MSD test points for intermodulation interference due to dual uplink operation for PC2 EN-DC in NR FR1 involving two bands

#### 5.6.2.1.1 Power class 2 Case A

The additional MSD due to intermodulation for PC2 Case A DC\_2A\_n5A-n77A are defined in table 5.6.2.2.1-1.

Table 5.6.2.1.1-1: MSD test points for PCell due to dual uplink operation for PC2 EN-DC in NR FR1 (three bands)

| NR or E-UTRA Band / Channel bandwidth / NRB / MSD | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- |
| EN-DC Configuration | EUTRA / NR band | UL Fc  (MHz) | UL/DL BW  (MHz) | UL  LCRB | DL Fc (MHz) | MSD  (dB) | IMD order |
| DC\_2A\_n5A-n77A | 2 | 1880 | 5 | 25 | 1960 | N/A | N/A |
|  | n5 | 830 | 5 | 25 | 875 | N/A | N/A |
|  | n77 | 3540 | 10 | 50 | 3540 | 24.5 | IMD3 |
|  | 2 | 1907 | 5 | 25 | 1987 | N/A | N/A |
|  | n5 | 844 | 5 | 25 | 889 | 16.6 | IMD5 |
|  | n77 | 3305 | 10 | 50 | 3305 | N/A | N/A |

#### 5.6.2.1.2 Power class 2 Case B

The additional MSD due to intermodulation for PC2 Case B DC\_2A\_n5A-n77A are the same as the Case A defined in table 5.6.2.1.1-1.

## 5.7 DC\_66A\_n2A-n77A

### 5.7.1 Transmitter Characteristics

#### 5.7.1.1 Maximum Output Power

Table 5.7.1.1-1: Maximum output power for inter-band EN-DC (two bands)

| **EN-DC combination** | Power class 2 (dBm) | Tolerance (dB) |
| --- | --- | --- |
| DC\_66A\_n77A | 266 | +2/-3 |
| NOTE 6: The UE supports PC3 within E-UTRA cell group, and supports either PC3 or PC2 within NR cell group. Power class support within each individual cell group is signalled separately by the UE. | | |

#### 5.7.1.2 Co-existence study

According to the PC3 DC\_66A\_n2A-n77A study in 37.717-11-21, the Rx impacts are identified as below,

* 2nd, 4th and 5th order IMD generated by dual uplink of 66\_n77 may fall into own Rx of band n2.
* 2nd and 4th order IMD generated by dual uplink of 66\_n2 may fall into own Rx of band n77.

Thus, additional MSD for IMD 2, 4 and 5 should be considered to mitigate the impact of the interference for PC2 DC\_66A\_n2A-n77A combination.

### 5.7.2 Receiver Characteristics

#### 5.7.2.1 MSD test points for intermodulation interference due to dual uplink operation for PC2 EN-DC in NR FR1 involving two bands

#### 5.7.2.1.1 Power class 2 Case A

The additional MSD due to intermodulation for PC2 Case A DC\_66A\_n2A-n77A are defined in table 5.7.2.2.1-1.

Table 5.7.2.1.1-1: MSD test points for PCell due to dual uplink operation for PC2 EN-DC in NR FR1 (three bands)

| **NR or E-UTRA Band / Channel bandwidth / NRB / MSD** | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **EN-DC Configuration** | **EUTRA / NR band** | **UL Fc  (MHz)** | **UL/DL BW  (MHz)** | **UL**  **LCRB** | **DL Fc (MHz)** | **MSD  (dB)** | **IMD order** |
| DC\_66A\_n2A-n77A | 66 | 1740 | 5 | 25 | 2140 | N/A | N/A |
| n2 | 1880 | 5 | 25 | 1960 | N/A | N/A |
| n77 | 3620 | 10 | 50 | 3620 | 34.9 | IMD2 |
| 66 | 1740 | 5 | 25 | 2140 | N/A | N/A |
| n2 | 1880 | 5 | 25 | 1960 | N/A | N/A |
| n77 | 3340 | 10 | 50 | 3340 | 20.9 | IMD44 |
| n2 | 1880 | 5 | 25 | 1960 | 37.6 | IMD2 |
| 66 | 1740 | 5 | 25 | 2140 | N/A | N/A |
| n77 | 3700 | 10 | 50 | 3700 | N/A | N/A |
| n2 | 1880 | 5 | 25 | 1960 | 21.1 | IMD44 |
| 66 | 1770 | 5 | 25 | 2170 | N/A | N/A |
| n77 | 3350 | 10 | 50 | 3350 | N/A | N/A |
| NOTE 4: This band is subject to IMD5 also which MSD is not specified. | | | | | | | |

#### 5.7.2.1.2 Power class 2 Case B

The additional MSD due to intermodulation for PC2 Case B DC\_66A\_n2A-n77A are the same as the Case A defined in table 5.7.2.1.1-1.

## 5.8 DC\_66A\_n5A-n77A

### 5.8.1 Transmitter Characteristics

#### 5.8.1.1 Maximum Output Power

Table 5.8.1.1-1: Maximum output power for inter-band EN-DC (two bands)

| **EN-DC combination** | Power class 2 (dBm) | Tolerance (dB) |
| --- | --- | --- |
| DC\_66A\_n77A | 266 | +2/-3 |
| NOTE 6: The UE supports PC3 within E-UTRA cell group, and supports either PC3 or PC2 within NR cell group. Power class support within each individual cell group is signalled separately by the UE. | | |

#### 5.8.1.2 Co-existence study

According to the PC3 DC\_66A\_n5A-n77A study in 37.717-11-21, the Rx impacts are identified as below,

* 3rd 4th and 5th order IMD generated by dual uplink of 66\_n5 may fall into own Rx of band n77

Thus, additional MSD for IMD 3, 4 and 5 should be considered to mitigate the impact of the interference for PC2 DC\_66A\_n5A-n77A combination.

### 5.8.2 Receiver Characteristics

#### 5.8.2.1 MSD test points for intermodulation interference due to dual uplink operation for PC2 EN-DC in NR FR1 involving two bands

#### 5.8.2.1.1 Power class 2 Case A

The additional MSD due to intermodulation for PC2 Case A DC\_66A\_n5A-n77A are defined in table 5.8.2.2.1-1.

Table 5.8.2.1.1-1: MSD test points for PCell due to dual uplink operation for PC2 EN-DC in NR FR1 (three bands)

| **NR or E-UTRA Band / Channel bandwidth / NRB / MSD** | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **EN-DC Configuration** | **EUTRA / NR band** | **UL Fc  (MHz)** | **UL/DL BW  (MHz)** | **UL**  **LCRB** | **DL Fc (MHz)** | **MSD  (dB)** | **IMD order** |
| DC\_66A\_n5A-n77A DC\_66A-66A\_n5A-n77A | 66 | 1760 | 5 | 25 | 2160 | N/A | N/A |
| n5 | 830 | 5 | 25 | 875 | N/A | N/A |
| n77 | 3420 | 10 | 50 | 3420 | 24.9 | IMD3 |
| 66 | 1714 | 5 | 25 | 2114 | N/A | N/A |
| n5 | 827 | 5 | 25 | 872 | N/A | N/A |
| n77 | 4195 | 10 | 50 | 4195 | 24.1 | IMD44 |
| NOTE 4: This band is subject to IMD5 also which MSD is not specified. | | | | | | | |

#### 5.8.2.1.2 Power class 2 Case B

The additional MSD due to intermodulation for PC2 Case B DC\_66A\_n5A-n77A are the same as the Case A defined in table 5.8.2.1.1-1.

## 5.9 DC\_2-13\_n66-n77

### 5.9.1 Maximum Output Power

Table 5.9.1-1: Maximum output power for inter-band EN-DC (two bands)

| **EN-DC combination** | Power class 2 (dBm) | Tolerance (dB) |
| --- | --- | --- |
| DC\_2A\_n77A DC\_13A\_n77A | 266 | +2/-3 |
| NOTE 6: The UE supports PC3 within E-UTRA cell group, and supports either PC3 or PC2 within NR cell group. Power class support within each individual cell group is signalled separately by the UE. | | |

5.9.2 Configurations for EN-DC

Table 5.9.2-1: Inter-band EN-DC configurations within FR1 (four bands)

| EN-DC  Configuration | Uplink EN-DC  configuration |
| --- | --- |
| DC\_2A-13A\_n66A-n77A | DC\_2A\_n77A DC\_13A\_n77A |

#### 5.9.3 Co-existence study

MSD have been defined for lower order combinations [2, 3]. No further MSD is needed for both Case A and B.

## 5.10 DC\_2-13-66\_n77

#### 5.10.1 Maximum Output Power

Table 5.10.1-1: Maximum output power for inter-band EN-DC (two bands)

| **EN-DC combination** | Power class 2 (dBm) | Tolerance (dB) |
| --- | --- | --- |
| DC\_2A\_n77A,  DC\_13A\_n77A,  DC\_66A\_n77A | 266 | +2/-3 |
| NOTE 6: The UE supports PC3 within E-UTRA cell group, and supports either PC3 or PC2 within NR cell group. Power class support within each individual cell group is signalled separately by the UE. | | |

#### 5.10.2 Configuration for EN-DC

Table 5.10.2-1: Inter-band EN-DC configurations within FR1 (four bands)

| EN-DC  Configuration | Uplink EN-DC  configuration |
| --- | --- |
| DC\_2A-13A-66A\_n77A | DC\_2A\_n77A,  DC\_13A\_n77A,  DC\_66A\_n77A |

#### 5.10.3 Co-existence study

MSD have been defined for lower order combinations [2]. No further MSD is needed for both Case A and B.

## 5.11 DC\_13-66\_n2-n77

### 5.11.1 Maximum Output Power

Table 5.11.1-1: Maximum output power for inter-band EN-DC (two bands)

| **EN-DC combination** | Power class 2 (dBm) | Tolerance (dB) |
| --- | --- | --- |
| DC\_13A\_n77A,  DC\_66A\_n77A | 266 | +2/-3 |
| NOTE 6: The UE supports PC3 within E-UTRA cell group, and supports either PC3 or PC2 within NR cell group. Power class support within each individual cell group is signalled separately by the UE. | | |

5.11.2 Configurations for EN-DC

Table 5.11.2-1: Inter-band EN-DC configurations within FR1 (four bands)

| EN-DC  Configuration | Uplink EN-DC  configuration |
| --- | --- |
| DC\_13A-66A\_n2A-n77A | DC\_13A\_n77A,  DC\_66A\_n77A |

#### 5.11.2 Co-existence study

MSD have been defined for lower order combinations [2, 3]. No further MSD is needed for both Case A and B

## 5.12 DC\_2-66\_n5-n77

### 5.12.1 Maximum Output Power

Table 5.12.1-1: Maximum output power for inter-band EN-DC (two bands)

| **EN-DC combination** | Power class 2 (dBm) | Tolerance (dB) |
| --- | --- | --- |
| DC\_66A\_n77A,  DC\_2A\_n77A | 266 | +2/-3 |
| NOTE 6: The UE supports PC3 within E-UTRA cell group, and supports either PC3 or PC2 within NR cell group. Power class support within each individual cell group is signalled separately by the UE. | | |

5.12.2 Configurations for EN-DC

Table 5.12.2-1: Inter-band EN-DC configurations within FR1 (four bands)

| EN-DC  Configuration | Uplink EN-DC  configuration |
| --- | --- |
| DC\_2A-66A\_n5A-n77A | DC\_66A\_n77A,  DC\_2A\_n77A |

#### 5.12.3 Co-existence study

MSD have been defined for lower order combinations [2]. No further MSD is needed for both Case A and B

## 5.13 DC\_2-5-66\_n77

### 5.13.1 Maximum Output Power

Table 5.13.1-1: Maximum output power for inter-band EN-DC (two bands)

| **EN-DC combination** | Power class 2 (dBm) | Tolerance (dB) |
| --- | --- | --- |
| DC\_2A\_n77A,  DC\_5A\_n77A,  DC\_66A\_n77A | 266 | +2/-3 |
| NOTE 6: The UE supports PC3 within E-UTRA cell group, and supports either PC3 or PC2 within NR cell group. Power class support within each individual cell group is signalled separately by the UE. | | |

5.13.2 Configurations for EN-DC

Table 5.13.2-1: Inter-band EN-DC configurations within FR1 (four bands)

| EN-DC  Configuration | Uplink EN-DC  configuration |
| --- | --- |
| DC\_2A-5A-66A\_n77A | DC\_2A\_n77A,  DC\_5A\_n77A,  DC\_66A\_n77A |

#### 5.13.3 Co-existence study

MSD have been defined for lower order combinations [2]. No further MSD is needed for both Case A and B.

## 5.14 DC\_13\_n66-n77

### 5.14.1 Transmitter Characteristics

#### 5.14.1.1 Maximum Output Power

Table 5.14.1.1-1: Maximum output power for inter-band EN-DC (two bands)

| **EN-DC combination** | Power class 2 (dBm) | Tolerance (dB) |
| --- | --- | --- |
| DC\_13A\_n77A | 266 | +2/-3 |
| NOTE 6: The UE supports PC3 within E-UTRA cell group, and supports either PC3 or PC2 within NR cell group. Power class support within each individual cell group is signalled separately by the UE. | | |

5.14.1.2 Configurations for EN-DC

Table 5.14.1.2-1: Inter-band EN-DC configurations within FR1 (four bands)

| EN-DC  Configuration | Uplink EN-DC  configuration |
| --- | --- |
| DC\_13A\_n66A-n77A | DC\_13A\_n77A |

#### 5.14.1.3 Co-existence study

According to the both PC3 DC\_13A\_n66A-n77A study in 37.717-11-21 and only DC\_13A\_n77A uplink configuration applied in this band combination, additional MSD due to IMD 3 to the band n66 from the configured uplink EN-DC should be considered to mitigate the impact of the interference to the PC2 DC\_13A\_n66A-n77A combination.

IMD generated by DC\_13A\_n77A that falls into the third band, n66

### 5.14.2 Receiver Characteristics

#### 5.14.2.1 MSD test points for intermodulation interference due to dual uplink operation for PC2 EN-DC in NR FR1 involving two bands

#### 5.14.2.1.1 Power class 2 Case A

The additional MSD due to intermodulation for PC2 Case A of DC\_13A\_n66A-n77A are defined in table 5.14.2.1.1-1.

Table 5.14.2.1.1-1: MSD test points for PCell due to dual uplink operation for PC2 EN-DC in NR FR1 (three bands)

| **NR or E-UTRA Band / Channel bandwidth / NRB / MSD** | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **EN-DC Configuration** | **EUTRA / NR band** | **UL Fc  (MHz)** | **UL/DL BW  (MHz)** | **UL**  **LCRB** | **DL Fc (MHz)** | **MSD  (dB)** | **IMD order** |
| DC\_13A\_n66A-n77A | 13 | 782 | 5 | 25 | 751 | N/A | N/A |
| n66 | 1756 | 5 | 25 | 2156 | 26.1 | IMD3 |
| n77 | 3720 | 10 | 50 | 3720 | N/A | N/A |

#### 5.14.2.1.2 Power class 2 Case B

The additional MSD due to intermodulation for PC2 Case B of DC\_13A\_n66A-n77A are the same as the Case A defined in table 5.14.2.1.1-1.

## 5.15 DC\_13\_n2-n77

### 5.15.1 Transmitter Characteristics

#### 5.15.1.1 Maximum Output Power

Table 5.15.1.1-1: Maximum output power for inter-band EN-DC (two bands)

| **EN-DC combination** | Power class 2 (dBm) | Tolerance (dB) |
| --- | --- | --- |
| DC\_13A\_n77A | 266 | +2/-3 |
| NOTE 6: The UE supports PC3 within E-UTRA cell group, and supports either PC3 or PC2 within NR cell group. Power class support within each individual cell group is signalled separately by the UE. | | |

5.15.1.2 Configurations for EN-DC

Table 5.15.1.2-1: Inter-band EN-DC configurations within FR1 (four bands)

| EN-DC  Configuration | Uplink EN-DC  configuration |
| --- | --- |
| DC\_13A\_n2A-n77A | DC\_13A\_n77A |

#### 5.15.1.3 Co-existence study

According to the both PC3 DC\_13A\_n2A-n77A study in 37.717-11-21 and only DC\_13A\_n77A uplink configuration applied in this band combination, additional MSD due to IMD 3 to the band n2 from the configured uplink EN-DC should be considered to mitigate the impact of the interference to the PC2 DC\_13A\_n66A-n77A combination.

### 5.15.2 Receiver Characteristics

#### 5.15.2.1 MSD test points for intermodulation interference due to dual uplink operation for PC2 EN-DC in NR FR1 involving two bands

#### 5.15.2.1.1 Power class 2 Case A

The additional MSD due to intermodulation for PC2 Case A of DC\_13A\_n2A-n77A are defined in table 5.15.2.2.1-1.

Table 5.15.2.1.1-1: MSD test points for PCell due to dual uplink operation for PC2 EN-DC in NR FR1 (three bands)

| **NR or E-UTRA Band / Channel bandwidth / NRB / MSD** | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **EN-DC Configuration** | **EUTRA / NR band** | **UL Fc  (MHz)** | **UL/DL BW  (MHz)** | **UL**  **LCRB** | **DL Fc (MHz)** | **MSD  (dB)** | **IMD order** |
| DC\_13A\_n2A-n77A | 13 | 782 | 5 | 25 | 751 | N/A | N/A |
| n2 | 1880 | 5 | 25 | 1960 | 25.0 | IMD3 |
| n77 | 3524 | 10 | 50 | 3524 | N/A | N/A |

#### 5.15.2.1.2 Power class 2 Case B

The additional MSD due to intermodulation for PC2 Case B of DC\_13A\_n2A-n77A are the same as the Case A defined in table 5.15.2.1.1-1.

## 5.16 DC\_2A-66A\_n41A

### 5.16.1 Transmitter Characteristics

#### 5.16.1.1 Maximum Output Power

Table 5.16.1.1-1: Maximum output power for inter-band EN-DC (two bands)

| **EN-DC combination** | Power class 2 (dBm) | Tolerance (dB) |
| --- | --- | --- |
| DC\_66A\_n41A | 266 | +2/-3 |
| NOTE 6: The UE supports PC3 within E-UTRA cell group, and supports either PC3 or PC2 within NR cell group. Power class support within each individual cell group is signalled separately by the UE. | | |

#### 5.16.1.2 Co-existence study

According to the PC3 DC\_2A\_66A-n41A study in 37.716-21-11, the Rx impacts are identified as below,

* Co-existence analysis for DC\_2\_n41 shows that there is no impact from DC\_2\_n41 UL to Band 66 DL.
* Co-existence analysis for DC\_66\_n41 shows that there is IMD4 impact from DC\_66\_n41 UL to Band 2 DL.

Thus, additional MSD for IMD 4 should be considered to mitigate the impact of the interference for PC2 DC\_2A\_66A-n41A combination.

### 5.16.2 Receiver Characteristics

#### 5.16.2.1 MSD test points for intermodulation interference due to dual uplink operation for PC2 EN-DC in NR FR1 involving two bands

#### 5.16.2.1.1 Power class 2 Case A

The additional MSD due to intermodulation for PC2 Case A DC\_2A\_66A-n41A are defined in table 5.16.2.2.1-1.

Table 5.16.2.1.1-1: MSD test points for PCell due to dual uplink operation for PC2 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\_2A-66A\_n41A | 2 | 1860 | 5 | 25 | 1940 | 22.6 | IMD4 |
| 66 | 1715 | 5 | 25 | 2115 | N/A | N/A |
| n41 | 2685 | 5 | 25 | 2685 | N/A | N/A |

#### 5.16.2.1.2 Power class 2 Case B

The additional MSD due to intermodulation for PC2 Case B DC\_2A\_66A-n41A are the same as the Case A defined in table 5.16.2.1.1-1.

## 5.17 DC\_66\_n66-n77

### 5.17.1 Transmitter Characteristics

#### 5.17.1.1 Maximum Output Power

Table 5.17.1.1-1: Maximum output power for inter-band EN-DC (two bands)

| **EN-DC combination** | Power class 2 (dBm) | Tolerance (dB) |
| --- | --- | --- |
| DC\_66A\_n77A | 266 | +2/-3 |
| NOTE 6: The UE supports PC3 within E-UTRA cell group, and supports either PC3 or PC2 within NR cell group. Power class support within each individual cell group is signalled separately by the UE. | | |

5.17.1.2 Configurations for EN-DC

Table 5.17.1.2-1: Inter-band EN-DC configurations within FR1 (three bands)

| EN-DC  Configuration | Uplink EN-DC  configuration |
| --- | --- |
| DC\_66A\_n66A-n77A | DC\_66A\_n77A |

#### 5.17.1.2 Co-existence study

According to the PC2 coexistence studies performed in the lower order combinations, the Rx impacts are identified as below,

* For UL DC\_66A\_n77A configuration, IMD2 and IMD5 products fall into the band n66 Rx

Thus additional MSD exception should be considered to mitigate the impact of the interference.

### 5.17.2 Receiver Characteristics

#### 5.17.2.1 MSD test points for intermodulation interference due to dual uplink operation for PC2 EN-DC in NR FR1 involving two bands

#### 5.17.2.1.1 Power class 2 Case A

Based on co-existence study, additional MSD are specified Table 5.17.2.1.1-1 for this dual connectivity configuration.

Table 5.17.2.1.1-1: MSD test points for SCell due to dual uplink operation for PC2 EN-DC in NR FR1 (three bands)

| **NR or E-UTRA Band / Channel bandwidth / NRB / MSD** | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **EN-DC Configuration** | **EUTRA / NR band** | **UL Fc  (MHz)** | **UL/DL BW  (MHz)** | **UL**  **LCRB** | **DL Fc (MHz)** | **MSD  (dB)** | **IMD order** |
| DC\_66A\_n66A-n77A | 66 | 1730 | 5 | 25 | 2130 | N/A | N/A |
| n66 | 1770 | 5 | 25 | 2170 | 37 | IMD2 |
| n77 | 3900 | 10 | 50 | 3900 | N/A | N/A |
| 66 | 1730 | 5 | 25 | 2130 | N/A | N/A |
| n66 | 1770 | 5 | 25 | 2170 | 20 | IMD5 |
| n77 | 3680 | 10 | 50 | 3680 | N/A | N/A |

#### 5.17.2.1.2 Power class 2 Case B

The additional MSD due to intermodulation for PC2 Case B configuration are same as the Case A defined in table 5.17.2.1.1-1.

## 5.18 DC\_48-66\_n77

### 5.18.1 Transmitter Characteristics

#### 5.18.1.1 Maximum Output Power

Table 5.18.1.1-1: Maximum output power for inter-band EN-DC (two bands)

| **EN-DC combination** | Power class 2 (dBm) | Tolerance (dB) |
| --- | --- | --- |
| DC\_66A\_n77A | 266 | +2/-3 |
| NOTE 6: The UE supports PC3 within E-UTRA cell group, and supports either PC3 or PC2 within NR cell group. Power class support within each individual cell group is signalled separately by the UE. | | |

5.18.1.2 Configurations for EN-DC

Table 5.18.1.2-1: Inter-band EN-DC configurations within FR1 (three bands)

| EN-DC  Configuration | Uplink EN-DC  configuration |
| --- | --- |
| DC\_48A-66A\_n77A  DC\_48C-66A\_n77A | DC\_66A\_n77A |

#### 5.18.1.3 Co-existence study

According to coxeistence studies for the PC3 DC\_48A-66A\_n77A in TR 37.717-21-11, no harmonics and intermodulation products is present as the duplex mode for both band 48 and n77 is TDD and opertion in fully synchronizing in US.

### 5.18.2 Receiver Characteristics

#### 5.18.2.1 MSD test points for intermodulation interference due to dual uplink operation for PC2 EN-DC in NR FR1 involving two bands

There is no additional MSD requirement for this PC2 band combination.

## 5.19 DC\_13\_n5-n77

### 5.19.1 Transmitter Characteristics

#### 5.19.1.1 Maximum Output Power

Table 5.19.1.1-1: Maximum output power for inter-band EN-DC (two bands)

| **EN-DC combination** | Power class 2 (dBm) | Tolerance (dB) |
| --- | --- | --- |
| DC\_13A\_n77A | 266 | +2/-3 |
| NOTE 6: The UE supports PC3 within E-UTRA cell group, and supports either PC3 or PC2 within NR cell group. Power class support within each individual cell group is signalled separately by the UE. | | |

5.19.1.2 Configurations for EN-DC

Table 5.19.1.2-1: Inter-band EN-DC configurations within FR1 (three bands)

| EN-DC  Configuration | Uplink EN-DC  configuration |
| --- | --- |
| DC\_13A\_n5A-n77A | DC\_13A\_n77A |

#### 5.19.1.3 Co-existence study

According to the PC3 DC\_13A\_n77A study in TR 37.717-21-11, the Rx impacts are identified as below,

* For UL DC\_13A\_n77A, IMD5 of the 2UL falls into band n5 Rx

Thus additional MSD should be considered to mitigate the impact of the interference.

### 5.19.2 Receiver Characteristics

#### 5.19.2.1 MSD test points for intermodulation interference due to dual uplink operation for PC2 EN-DC in NR FR1 involving two bands

#### 5.19.2.1.1 Power class 2 Case A

Based on co-existence study, additional MSD are specified Table 5.19.2.1.1-1 for this dual connectivity configuration.

Table 5.19.2.1.1-1: MSD test points for SCell due to dual uplink operation for PC2 EN-DC in NR FR1 (three bands)

| NR or E-UTRA Band / Channel bandwidth / NRB / MSD | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- |
| EN-DC  Configuration | EUTRA or NR band | UL Fc  (MHz) | UL/DL BW  (MHz) | UL  LCRB | DL Fc (MHz) | MSD  (dB) | IMD order |
| DC\_13A\_n5A-n77A11 | n5 | 840 | 5 | 25 | 885 | 19.5 | IMD5 |
| 13 | 782 | 5 | 20 | 751 | N/A | N/A |
| n77 | 4013 | 10 | 50 | 4013 | N/A | N/A |
| NOTE 11: The MSD test points cannot be verified for the band combination in US due to the Band n77 frequency range restriction. | | | | | | | |

#### 5.19.2.1.2 Power class 2 Case B

The additional MSD due to intermodulation for PC2 Case B configuratoin are same as the Case A defined in table 5.19.2.1.1-1.

## 5.20 DC\_5\_n66-n77

### 5.20.1 Transmitter Characteristics

#### 5.20.1.1 Maximum Output Power

Table 5.20.1.1-1: Maximum output power for inter-band EN-DC (two bands)

| **EN-DC combination** | Power class 2 (dBm) | Tolerance (dB) |
| --- | --- | --- |
| DC\_5A\_n77A | 266 | +2/-3 |
| NOTE 6: The UE supports PC3 within E-UTRA cell group, and supports either PC3 or PC2 within NR cell group. Power class support within each individual cell group is signalled separately by the UE. | | |

#### 

5.20.1.2 Configurations for EN-DC

Table 5.20.1.2-1: Inter-band EN-DC configurations within FR1 (three bands)

| EN-DC  Configuration | Uplink EN-DC  configuration |
| --- | --- |
| DC\_5A\_n66A-n77A | DC\_5A\_n77A |

#### 5.20.1.3 Co-existence study

For UL DC\_5A\_n77A, IMD3 generated by dual uplink of 5\_n77 may fall into own Rx of band n66.

Thus additional MSD exception should be considered to mitigate the impact of the interference.

### 5.20.2 Receiver Characteristics

#### 5.20.2.1 MSD test points for intermodulation interference due to dual uplink operation for PC2 EN-DC in NR FR1 involving two bands

#### 5.20.2.1.1 Power class 2 Case A

Based on co-existence study, additional MSD are specified Table 5.20.2.1.1-1 for this dual connectivity configuration.

Table 5.20.2.1.1-1: MSD test points for SCell due to dual uplink operation for PC2 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\_n66A-n77A | 5 | 826.5 | 5 | 25 | 871.5 | N/A | N/A |
| n66 | 1742 | 5 | 25 | 2142 | 22.2 | IMD3 |
| n77 | 3795 | 10 | 50 | 3795 | N/A | N/A |

#### 5.20.2.1.2 Power class 2 Case B

The additional MSD due to intermodulation for PC2 Case B configuration are same as the Case A defined in table 5.20.2.1.1-1.

## 5.21 DC\_5A\_n5A-n77A

### 5.21.1 Transmitter Characteristics

#### 5.21.1.1 Maximum Output Power

Table 5.21.1.1-1: Maximum output power for inter-band EN-DC (two bands)

| **EN-DC combination** | Power class 2 (dBm) | Tolerance (dB) |
| --- | --- | --- |
| DC\_5A\_n77A | 266 | +2/-3 |
| NOTE 6: The UE supports PC3 within E-UTRA cell group, and supports either PC3 or PC2 within NR cell group. Power class support within each individual cell group is signalled separately by the UE. | | |

5.21.1.2 Configurations for EN-DC

Table 5.21.1.2-1: Inter-band EN-DC configurations within FR1 (three bands)

| EN-DC  Configuration | Uplink EN-DC  configuration |
| --- | --- |
| DC\_5A\_n5A-n77A | DC\_5A\_n77A |

#### 5.21.1.3 Co-existence study

According to the co-existence studies performed in the lower order combinations, the Rx impacts are identified as below,

* For UL DC\_5A\_n77A configuration, IMD4 and IMD5 products fall into the band n5 Rx

Thus additional MSD should be considered to mitigate the impact of the interference

### 5.21.2 Receiver Characteristics

#### 5.21.2.1 MSD test points for intermodulation interference due to dual uplink operation for PC2 EN-DC in NR FR1 involving two bands

#### 5.21.2.1.1 Power class 2 Case A

Based on co-existence study, additional MSD are specified Table 5.21.2.1.1-1 for this dual connectivity configuration.

Table 5.21.2.1.1-1: MSD test points for SCell due to dual uplink operation for PC2 EN-DC in NR FR1 (three bands)

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **NR EN-DC**  **Configuration** | **NR band** | **UL Fc**  **(MHz)** | **UL/DL BW**  **(MHz)** | **UL**  **CLRB** | **DL Fc (MHz)** | **MSD for PC2**  **(dB)** | **Duplex mode** | **Source of IMD** |
| DC\_5A\_n5A-n77A11 | 5 | 844 | 5 | 25 | 889 | N/A | FDD | N/A |
| n5 | 844 | 5 | 25 | 889 | 20.3 | FDD | IMD44 |
| n77 | 3421 | 10 | 50 | 3421 | N/A | TDD | N/A |
| NOTE 4: This band is subject to IMD5 also which MSD is not specified.  NOTE 11: The MSD test points cannot be verified for the band combination in US due to the Band n77 frequency range restriction. | | | | | | | | |

#### 5.21.2.1.2 Power class 2 Case B

The additional MSD due to intermodulation for PC2 Case B configuration are same as the Case A defined in table 5.21.2.1.1-1.

## 5.22 DC\_5\_n2-n77

### 5.22.1 Transmitter Characteristics

#### 5.22.1.1 Maximum Output Power

Table 5.22.1.1-1: Maximum output power for inter-band EN-DC (two bands)

| **EN-DC combination** | Power class 2 (dBm) | Tolerance (dB) |
| --- | --- | --- |
| DC\_5A\_n77A | 266 | +2/-3 |
| NOTE 6: The UE supports PC3 within E-UTRA cell group, and supports either PC3 or PC2 within NR cell group. Power class support within each individual cell group is signalled separately by the UE. | | |

5.22.1.2 Configurations for EN-DC

Table 5.22.1.2-1: Inter-band EN-DC configurations within FR1 (three bands)

| EN-DC  Configuration | Uplink EN-DC  configuration |
| --- | --- |
| DC\_5A\_n2A-n77A | DC\_5A\_n77A |

#### 5.22.1.3 Co-existence study

According to coexistence studies performed in the PC3 DC\_5A\_n2A-n77A configuration, the Rx impacts are identified as below

* For UL DC\_5A\_n77A, IMD3 of 2UL may fall into own Rx of band n2.

Thus additional MSD should be considered to mitigate the impact of the interference for DC\_5A\_n2A-n77A combination.

### 5.22.2 Receiver Characteristics

#### 5.22.2.1 MSD test points for intermodulation interference due to dual uplink operation for PC2 EN-DC in NR FR1 involving two bands

#### 5.22.2.1.1 Power class 2 Case A

Based on co-existence study, additional MSD are specified Table 5.22.2.1.1-1 for this dual connectivity configuration.

**Table 5.22.2.1.1-1: MSD test points for SCell due to dual uplink operation for PC2 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\_5A\_n2A-n77A11 | n2 | 1907 | 5 | 25 | 1987 | 25.5 | IMD3 |
| 5 | 846.5 | 5 | 25 | 891.5 | N/A | N/A |
| n77 | 3680 | 5 | 25 | 3680 | N/A | N/A |
| NOTE 11: The MSD test points cannot be verified for the band combination in US due to the Band n77 frequency range restriction. | | | | | | | |

#### 5.22.2.1.2 Power class 2 Case B

The additional MSD due to intermodulation for PC2 Case B configuratoin are same as the Case A defined in table 5.22.2.1.1-1.

## 5.23 DC\_2\_n66-n77

### 5.23.1 Transmitter Characteristics

#### 5.23.1.1 Maximum Output Power

Table 5.23.1.1-1: Maximum output power for inter-band EN-DC (two bands)

| **EN-DC combination** | Power class 2 (dBm) | Tolerance (dB) |
| --- | --- | --- |
| DC\_2A\_n77A | 266 | +2/-3 |
| NOTE 6: The UE supports PC3 within E-UTRA cell group, and supports either PC3 or PC2 within NR cell group. Power class support within each individual cell group is signalled separately by the UE. | | |

5.23.1.2 Configurations for EN-DC

Table 5.23.1.2-1: Inter-band EN-DC configurations within FR1 (three bands)

| EN-DC  Configuration | Uplink EN-DC  configuration |
| --- | --- |
| DC\_2A\_n66A-n77A  DC\_2A-2A\_n66A-n77A | DC\_2A\_n77A |

#### 5.23.1.3 Co-existence study

Based on co-existence specified in 38.101-3 for the configuration,

* For UL DC\_2A\_n77A configuration, IMD2, IMD4 and IMD5 fall into own band n66 Rx.

Thus additional MSD should be considered to mitigate the impact of the interference.

### 5.23.2 Receiver Characteristics

#### 5.23.2.1 MSD test points for intermodulation interference due to dual uplink operation for PC2 EN-DC in NR FR1 involving two bands

#### 5.23.2.1.1 Power class 2 Case A

Based on co-existence study, additional MSD are specified Table 5.23.2.1.1-1 for this dual connectivity configuration.

Table 5.23.2.1.1-1: Reference sensitivity exceptions for Scell due to dual uplink operation for 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\_n66A-n77A DC\_2A-2A\_n66A-n77A | 2 | 1855 | 5 | 25 | 1935 | N/A | N/A |
| n66 | 1715 | 5 | 25 | 2115 | 35.2 | IMD2 |
| n77 | 3970 | 10 | 50 | 3970 | N/A | N/A |
| 2 | 1900 | 5 | 25 | 1980 | N/A | N/A |
| n66 | 1760 | 5 | 25 | 2160 | 22.3 | IMD44 |
| n77 | 3540 | 10 | 50 | 3540 | N/A | N/A |
| NOTE 4: This UE channel bandwidth is optional in this release of the specification. | | | | | | | |

#### 5.23.2.1.2 Power class 2 Case B

The additional MSD due to intermodulation for PC2 Case B configuratoin are same as the Case A defined in table 5.23.2.1.1-1.

## 5.24 DC\_2-48\_n77

### 5.24.1 Transmitter Characteristics

#### 5.24.1.1 Maximum Output Power

Table 5.24.1.1-1: Maximum output power for inter-band EN-DC (two bands)

| **EN-DC combination** | Power class 2 (dBm) | Tolerance (dB) |
| --- | --- | --- |
| DC\_2A\_n77A | 266 | +2/-3 |
| NOTE 6: The UE supports PC3 within E-UTRA cell group, and supports either PC3 or PC2 within NR cell group. Power class support within each individual cell group is signalled separately by the UE. | | |

5.24.1.2 Configurations for EN-DC

Table 5.24.1.2-1: Inter-band EN-DC configurations within FR1 (three bands)

| EN-DC  Configuration | Uplink EN-DC  configuration |
| --- | --- |
| DC\_2A-48A\_n77A  DC\_2A-48C\_n77A  DC\_2A-48D\_n77A | DC\_2A\_n77A |

#### 5.24.1.3 Co-existence study

According to the co-existence studies performed, no IMD issue is identified for this configuration.

### 5.24.2 Receiver Characteristics

#### 5.24.2.1 MSD test points for intermodulation interference due to dual uplink operation for PC2 EN-DC in NR FR1 involving two bands

There is no additional MSD requirement for this PC2 band combination.

## 5.25 DC\_2A\_n2A-n77A

### 5.25.1 Transmitter Characteristics

#### 5.25.1.1 Maximum Output Power

Table 5.25.1.1-1: Maximum output power for inter-band EN-DC (two bands)

| **EN-DC combination** | Power class 2 (dBm) | Tolerance (dB) |
| --- | --- | --- |
| DC\_2A\_n77A | 266 | +2/-3 |
| NOTE 6: The UE supports PC3 within E-UTRA cell group, and supports either PC3 or PC2 within NR cell group. Power class support within each individual cell group is signalled separately by the UE. | | |

5.25.1.2 Configurations for EN-DC

Table 5.25.1.2-1: Inter-band EN-DC configurations within FR1 (three bands)

| EN-DC  Configuration | Uplink EN-DC  configuration |
| --- | --- |
| DC\_2A\_n2A-n77A | DC\_2A\_n77A |

#### 5.25.1.3 Co-existence study

According to the PC2 coexistence studies performed in the lower order combinations, the Rx impacts are identified as below,

* For UL DC\_2A\_n77A, IMD2, IMD4 and IMD5 products fall into the band n2 Rx

Thus additional MSD should be considered to mitigate the impact of the interference.

### 5.25.2 Receiver Characteristics

#### 5.25.2.1 MSD test points for intermodulation interference due to dual uplink operation for PC2 EN-DC in NR FR1 involving two bands

#### 5.25.2.1.1 Power class 2 Case A

Based on co-existence study, additional MSD are specified Table 5.25.2.1.1-1 for this dual connectivity configuration.

Table 5.25.2.1.1-1: MSD test points for PCell due to dual uplink operation for PC2 EN-DC in NR FR1

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Band / Channel bandwidth / NRB / Duplex mode** | | | | | | | | |  |  |
| **EN-DC** | **NR band** | **UL Fc** | **UL/DL BW** | **UL** | **DL Fc (MHz)** | **MSD for PC2** | **Duplex mode** | **Source of IMD** |
| **Configuration** | **(MHz)** | **(MHz)** | **CLRB** | **(dB)** |
| DC\_2A\_n2A-n77A | 2 | 1855 | 5 | 25 | 1935 | N/A | FDD | N/A |
| n2 | 1855 | 5 | 25 | 1935 | 32.0 | FDD | IMD2 |
| 34.75 |
| n77 | 3790 | 10 | 50 | 3790 | N/A | TDD | N/A |
| 2 | 1885 | 5 | 25 | 1965 | N/A | FDD | N/A |
| n2 | 1865 | 5 | 25 | 1945 | 20.0 | FDD | IMD44 |
| 22.75 |
| n77 | 3710 | 10 | 50 | 3710 | N/A | TDD | N/A |
| NOTE 4: This band is subject to IMD5 also which MSD is not specified.  NOTE 5: Applicable only if operation with 4 antenna ports is supported in the band with carrier aggregation configured. | | | | | | | | |

#### 5.25.2.1.2 Power class 2 Case B

The additional MSD due to intermodulation for PC2 Case B configuration are same as the Case A defined in table 5.25.2.1.1-1.

## 5.26 DC\_1A-5A\_n78A

### 5.26.1 Transmitter Characteristics

#### 5.26.1.1 Maximum Output Power

Table 5.26.1.1-1: Maximum output power for inter-band EN-DC (two bands)

| **EN-DC combination** | Power class 2 (dBm) | Tolerance (dB) |
| --- | --- | --- |
| DC\_aA\_n78A | 266 | +2/-3 |
| NOTE 6: The UE supports PC3 within E-UTRA cell group, and supports either PC3 or PC2 within NR cell group. Power class support within each individual cell group is signalled separately by the UE. | | |

#### 5.26.1.2 Co-existence study

According to the PC3 DC\_1A\_5A-n78A study in 37.863-02-01, the Rx impacts are identified as below,

* Co-existence analysis for DC\_1\_n78 shows that there is IMD4 impact from DC\_1\_n78 UL to Band 1 and IMD5 impact from DC\_1\_n78 UL to Band 5 DL.
* Co-existence analysis for DC\_5\_n78 shows that there is IMD4 impact from DC\_5\_n78 UL to Band 5 DL and IMD3 impact from DC\_5\_n78 UL to Band 1 DL.

Thus, additional MSD for IMD 4 should be considered to mitigate the impact of the interference for PC2 DC\_1A\_5A-n78A combination.

### 5.26.2 Receiver Characteristics

#### 5.26.2.1 MSD test points for intermodulation interference due to dual uplink operation for PC2 EN-DC in NR FR1 involving two bands

#### 5.26.2.1.1 Power class 2 Case A

The additional MSD due to intermodulation for PC2 Case A DC\_1A\_5A-n78A are defined in table 5.26.2.2.1-1.

Table 5.26.2.1.1-1: MSD test points for PCell due to dual uplink operation for PC2 EN-DC in NR FR1 (three bands)

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **NR or E-UTRA Band / Channel bandwidth / NRB / MSD** | | | | | | | |
| **EN-DC Configuration** | **EUTRA and NR band** | **UL Fc  (MHz)** | **UL/DL BW  (MHz)** | **UL  LLRB** | **DL Fc (MHz)** | **MSD  (dB)** | **IMD order** |
| DC\_1A-5A\_n78A | 1 | 1930 | 5 | 25 | 2120 | 19.2 | IMD4 |
| 5 | 844 | 5 | 25 | 889 | N/A | N/A |
| n78 | 3670 | 10 | 52 | 3670 | N/A | N/A |
| DC\_1A-5A\_n78A | 1 | 1950 | 5 | 25 | 2140 | N/A | N/A |
| 5 | 844 | 5 | 25 | 889 | 19.2 | IMD4 |
| n78 | 3421 | 10 | 52 | 3421 | N/A | N/A |
| DC\_1A-5A\_n78A | 1 | 1932 | 5 | 25 | 2122 | 27.0 | IMD3 |
| 5 | 829 | 5 | 25 | 874 | N/A | N/A |
| n78 | 3780 | 10 | 52 | 3780 | N/A | N/A |
| DC\_1A-5A\_n78A | 1 | 1975 | 5 | 25 | 2165 | N/A | N/A |
| 5 | 840 | 5 | 25 | 885 | 13.2 | IMD5 |
| n78 | 3405 | 10 | 52 | 3405 | N/A | N/A |

#### 5.26.2.1.2 Power class 2 Case B

The additional MSD due to intermodulation for PC2 Case B DC\_1A\_5A-n78A are the same as the Case A defined in table 5.26.2.1.1-1.

## 5.27 DC\_1A-n7A\_n78A

### 5.27.1 Transmitter Characteristics

#### 5.27.1.1 Maximum Output Power

Table 5.27.1.1-1: Maximum output power for inter-band EN-DC (two bands)

| **EN-DC combination** | Power class 2 (dBm) | Tolerance (dB) |
| --- | --- | --- |
| DC\_aA\_n78A | 266 | +2/-3 |
| NOTE 6: The UE supports PC3 within E-UTRA cell group, and supports either PC3 or PC2 within NR cell group. Power class support within each individual cell group is signalled separately by the UE. | | |

#### 5.27.1.2 Co-existence study

According to the PC3 DC\_1A\_7A-n78A study in 37.863-02-01, the Rx impacts are identified as below,

* Co-existence analysis for DC\_1\_n78 shows that there is IMD4 impact from DC\_1\_n78 UL to Band 1 and Band 7 DL.
* Co-existence analysis for DC\_7\_n78 shows that there is IMD4 impact from DC\_7\_n78 UL to Band 1 DL.

Thus, additional MSD for IMD 4 should be considered to mitigate the impact of the interference for PC2 DC\_1A\_7A-n78A combination.

### 5.27.2 Receiver Characteristics

#### 5.27.2.1 MSD test points for intermodulation interference due to dual uplink operation for PC2 EN-DC in NR FR1 involving two bands

#### 5.27.2.1.1 Power class 2 Case A

The additional MSD due to intermodulation for PC2 Case A DC\_1A\_7A-n78A are defined in table 5.27.2.2.1-1.

Table 5.27.2.1.1-1: MSD test points for PCell due to dual uplink operation for PC2 EN-DC in NR FR1 (three bands)

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **NR or E-UTRA Band / Channel bandwidth / NRB / MSD** | | | | | | | |
| **EN-DC Configuration** | **EUTRA / NR band** | **UL Fc  (MHz)** | **UL/DL BW  (MHz)** | **UL  LLRB** | **DL Fc (MHz)** | **MSD  (dB)** | **IMD order** |
| DC\_1A-7A\_n78A | 1 | 1930 | 5 | 25 | 2120 | 19.2 | IMD4 |
| 7 | 2550 | 5 | 25 | 2670 | N/A | N/A |
| n78 | 3670 | 10 | 52 | 3670 | N/A | N/A |
| DC\_1A-7A\_n78A | 1 | 1977.5 | 5 | 25 | 2167.5 | N/A | N/A |
| 7 | 2507.5 | 5 | 25 | 2627.5 | 20.2 | IMD4 |
| n78 | 3305 | 10 | 52 | 3305 | N/A | N/A |
| DC\_1A-7A\_n78A | 1 | 1950 | 5 | 25 | 2140 | 19.7 | IMD4 |
| 7 | 2510 | 10 | 50 | 2630 | N/A | N/A |
| n78 | 3580 | 10 | 52 | 3580 | N/A | N/A |

#### 5.27.2.1.2 Power class 2 Case B

The additional MSD due to intermodulation for PC2 Case B DC\_1A\_7A-n78A are the same as the Case A defined in table 5.27.2.1.1-1.

# Annex A - Change history

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Date** | **Meeting** | **TDoc** | **Subject/Comment** | **New version** |
| 2021-04 | 3GPP RAN4#98-bis-e | R4-2105489 | Initial version  Implemented TP’s from RAN4 #98-bis-e:  R4-2105351, “TP for TR 37.xxx for DC\_2-5\_n77”, Verizon Denmark  R4-2105352, “TP for TR 37.xxx for DC\_2-13\_n77”, Verizon Denmark  R4-2105353, “TP for TR 37.xxx for DC\_2-66\_n77”, Verizon Denmark  R4-2105354, “TP for TR 37.xxx for DC\_5-66\_n77”, Verizon Denmark  R4-2105355, “TP for TR 37.xxx for DC\_13-66\_n77”, Verizon Denmark  R4-2105356, “TP for TR 37.xxx for DC\_2\_n5-n77”, Verizon Denmark  R4-2105357, “TP for TR 37.xxx for DC\_66\_n2-n77”, Verizon Denmark  R4-2105358, “TP for TR 37.xxx for DC\_66\_n5-n77”, Verizon Denmark | 0.0.1 |
| 2021-08 | 3GPP RAN4#100-e | R4-2113565 | Implemented TP’s from RAN4 #99-e:  R4-2108901, TP for TR 37.827 for DC\_2-13\_n66-n77, Verizon Denmark  R4-2108902, TP for TR 37.827 for DC\_2-13-66\_n77, Verizon Denmark  R4-2108903, TP for TR 37.827 for DC\_13-66\_n2-n77, Verizon Denmark  R4-2108904, TP for TR 37.827 for DC\_2-66\_n5-n77, Verizon Denmark  R4-2108905, TP for TR 37.827 for DC\_2-5-66\_n77, Verizon Denmark  R4-2107837, TP for TR 37.827 for DC\_13\_n66-n77, Verizon Denmark  R4-2107838, TP for TR 37.827 for DC\_13\_n2-n77, Verizon Denmark  R4-2110957, TP for PC2 DC\_2\_66-n41, Huawei Tech.(UK) Co.. Ltd | 0.1.0 |
| 2021-08 | 3GPP RAN4#100-e | R4-2113566 | Implemented TP’s from RAN4 #100-e:  [R4-2112669](ftp://ftp.3gpp.org/tsg_ran/WG4_Radio/TSGR4_94_eBis/Docs/R4-2112669.zip), TP for TR 37.827 for DC\_66\_n66-n77, Verizon, Samsung  [R4-2112670](ftp://ftp.3gpp.org/tsg_ran/WG4_Radio/TSGR4_94_eBis/Docs/R4-2112670.zip), TP to TR 37.717-21-11 for DC\_48-66\_n77, Verizon, Samsung  [R4-2112672](ftp://ftp.3gpp.org/tsg_ran/WG4_Radio/TSGR4_94_eBis/Docs/R4-2112672.zip) TP for TR 37.827 for DC\_13\_n5-n77, Verizon, Samsung  [R4-2112673](ftp://ftp.3gpp.org/tsg_ran/WG4_Radio/TSGR4_94_eBis/Docs/R4-2112673.zip), TP for TR 37.827 for DC\_5\_n66-n77, Verizon, Samsung  [R4-2114940](ftp://ftp.3gpp.org/tsg_ran/WG4_Radio/TSGR4_94_eBis/Docs/R4-2112674.zip) TP for TR 37.827 for DC\_5\_n5-n77, Verizon, Samsung  [R4-2114941](ftp://ftp.3gpp.org/tsg_ran/WG4_Radio/TSGR4_94_eBis/Docs/R4-2112676.zip) TP for TR 37.827 for DC\_5\_n2-n77, Verizon, Samsung  [R4-2112679](ftp://ftp.3gpp.org/tsg_ran/WG4_Radio/TSGR4_94_eBis/Docs/R4-2112679.zip), TP for TR 37.827 for DC\_2\_n66-n77, Verizon, Samsung  [R4-2112681](ftp://ftp.3gpp.org/tsg_ran/WG4_Radio/TSGR4_94_eBis/Docs/R4-2112681.zip), TP for TR 37.827 for DC\_2-48\_n77, Verizon, Samsung  [R4-2114942](ftp://ftp.3gpp.org/tsg_ran/WG4_Radio/TSGR4_94_eBis/Docs/R4-2112684.zip), TP for TR 37.827 for DC\_2\_n2-n77, Verizon, Samsung  [R4-2114043](ftp://ftp.3gpp.org/tsg_ran/WG4_Radio/TSGR4_94_eBis/Docs/R4-2114043.zip), Text proposal for TR 37.827 to include DC\_1A-5A\_n78A, Huawei Tech.(UK) Co.. Ltd  [R4-2114054](ftp://ftp.3gpp.org/tsg_ran/WG4_Radio/TSGR4_94_eBis/Docs/R4-2114054.zip), Text proposal for TR 37.827 to include DC\_1A-n7A\_n78A, Huawei Tech.(UK) Co.. Ltd | 0.2.0 |