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3rd Generation Partnership Project;

Technical Specification Group Radio Access Networks;

LTE inter-band CA for x bands DL (x=4, 5) with 1 band UL

(Release 16)



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# Foreword

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

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

# 1 Scope

The present document is a technical report on inter-band CA for x bands DL (x=4, 5) with 1 band UL under Rel-16 time frame. The purpose is to gather the relevant background information and studies in order to address 4 or 5 bands DL/1 band UL Inter-band Carrier Aggregation requirements for the Rel-16 band combinations in Table 1-1 and 1-2.

Table 1-1: Release 16 4 bands DL/1 band UL inter-band carrier aggregation combinations

|  |  |  |
| --- | --- | --- |
| **CA configuration** | **Uplink configuration** | **BCS** |
| CA\_1A-3A-5A-7A | - | 1 |
| CA\_1A-3A-3A-5A-7A | - | 0 |
| CA\_1A-3A-5A-28A | - | 0 |
| CA\_1A-3A-3A-7A-8A | - | 0 |
| CA\_1A-3A-7A-7A-8A | - | 0 |
| CA\_1A-3A-3A-7A-7A-8A | - | 0 |
| CA\_1A-3A-7A-7A-20A | - | 0 |
| CA\_1A-3A-3A-7C-28A | - | 0 |
| CA\_1A-3A-3A-7C-28A | CA\_7C | 0 |
| CA\_1A-1A-3A-3A-7A-28A | - | 0 |
| CA\_1A-1A-3A-3A-7C\_28A | - | 0 |
| CA\_1A-1A-3A-3A-7C\_28A | CA\_7C | 0 |
| CA\_1A-3A-7A-7A-28A | - | 0 |
| CA\_1A-3C-7A-28A | - | 0 |
| CA\_1A-3C-7C-28A | - | 0 |
| CA\_1A-3C-7A-28A | CA\_3C | 0 |
| CA\_1A-3C-7C-28A | CA\_3C | 0 |
| CA\_1A-3C-7C-28A | CA\_7C | 0 |
| CA\_1A-1A-3A-7A-28A | - | 0 |
| CA\_1A-1A-3A-7C-28A | - | 0 |
| CA\_1A-1A-3A-7C-28A | CA\_7C | 0 |
| CA\_1A-1A-3C-7A-28A | - | 0 |
| CA\_1A-1A-3C-7A-28A | CA\_3C | 0 |
| CA\_1A-1A-3C-7C-28A | - | 0 |
| CA\_1A-1A-3C-7C-28A | CA\_3C | 0 |
| CA\_1A-1A-3C-7C-28A | CA\_7C | 0 |
| CA\_1A-3C-7A-38A | - | 0 |
| CA\_1A-3A-7A-38A | - | 0 |
| CA\_1A-3A-7A-46E | - | 0 |
| CA\_1A-3A-7A-46D | - | 0 |
| CA\_1A-3A-7A-46C | - | 0 |
| CA\_1A-3A-7A-46A | - | 0 |
| CA\_1A-3A-8A-42A | - | 0 |
| CA\_1A-3A-8A-42C | - | 0 |
| CA\_1A-3A-18A-42C | - | 0 |
| CA\_1A-3A-18A-42A | - | 0 |
| CA\_1A-3A-28A-40A | - | 0 |
| CA\_1A-3A-28A-40C | - | 0 |
| CA\_1A-3A-41C-42C | - | 0 |
| CA\_1A-3A-41A-42C | - | 0 |
| CA\_1A-3A-41C-42A | - | 0 |
| CA\_1A-3A-41A-42A | - | 0 |
| CA\_1A-3A-41C-42C | CA\_42C | 0 |
| CA\_1A-3A-41A-42C | CA\_42C | 0 |
| CA\_1A-5A-7A-28A | - | 0 |
| CA\_1A-7A-28A-40A | - | 0 |
| CA\_1A-7A-28A-40C | - | 0 |
| CA\_1A-8A-11A-42A | - | 0 |
| CA\_1A-8A-11A-42C | - | 0 |
| CA\_2A-5A-46A-66A | - | 0 |
| CA\_2A-5A-46C-66A | - | 0 |
| CA\_2A-5A-46A-66A-66A | - | 0 |
| CA\_2A-5A-46D-66A | - | 0 |
| CA\_2A-5A-46C-66A-66A | - | 0 |
| CA\_2A-5A-46D-66A-66A | - | 0 |
| CA\_2A-5A-46E-66A | - | 0 |
| CA\_2A-7A-13A-66A | - | 0 |
| CA\_2A-7C-13A-66A | - | 0 |
| CA\_2A-7A-26A-66A | - | 0 |
| CA\_2A-7A-29A-66A | - | 0 |
| CA\_2A-7A-7A-29A-66A | - | 0 |
| CA\_2A-7C-29A-66A | - | 0 |
| CA\_2A-7A-30A-66A | - | 0 |
| CA\_2A-13A-46A-66A | - | 0 |
| CA\_2A-13A-46C-66A | - | 0 |
| CA\_2A-13A-46A-66A-66A | - | 0 |
| CA\_2A-13A-46D-66A | - | 0 |
| CA\_2A-13A-46C-66A-66A | - | 0 |
| CA\_2A-13A-46D-66A-66A | - | 0 |
| CA\_2A-46E-48A-66A | - | 0 |
| CA\_3A-5A-7A-28A | - | 0 |
| CA\_3A-5A-7C-28A | - | 0 |
| CA\_3A-3A-5A-7A-28A | - | 0 |
| CA\_3A-7A-28A-40A | - | 0 |
| CA\_3A-7A-28A-40C | - | 0 |
| CA\_3A-7A-32A-46E | - | 0 |
| CA\_3A-7A-32A-46D | - | 0 |
| CA\_3A-7A-32A-46C | - | 0 |
| CA\_3A-7A-32A-46A | - | 0 |
| CA\_3A-28A-41C-42C | - | 0 |
| CA\_3A-28A-41C-42C | CA\_42C | 0 |

Table 1-2: Release 16 5 bands DL/1 band UL inter-band carrier aggregation combinations

|  |  |  |
| --- | --- | --- |
| **CA configuration** | **Uplink configuration** | **BCS** |
| CA\_1A-3A-5A-7A-28A | - | 0 |
| CA\_1A-3A-7A-8A-20A | - | 0 |
| CA\_1A-3A-7A-20A-32A | - | 0 |

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

# 2 References

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

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

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

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

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

[2] RP-181408, “New WID on Rel16 LTE inter-band CA for 4 or 5 bands DL with 1 band UL”, RAN#80.

# 3 Definitions, symbols and abbreviations

## 3.1 Definitions

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

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

# 4 Background

The present document is a technical report for 4 or 5 bands DL/1 band UL Inter-band Carrier Aggregation under Rel-16 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 4 Band Carrier Aggregation with Single UL: Specific Band Combination Part

## 5.1 CA\_1-3-18-42

### 5.1.1 Channel bandwidths per operating band for CA

Table 5.1.1-1: Supported E-UTRA bandwidths per CA configuration for 4DL inter-band CA

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| CA operating / Channel bandwidth | | | | | | | | | | | | | Maximum aggregated bandwidth  [MHz] | Bandwidth Combination Set |
| CA Configuration | E-UTRA Bands | 1.4 MHz | | 3 MHz | | 5 MHz | | 10 MHz | | 15 MHz | 20 MHz | |
| CA\_1A-3A-18A-42A | 1 |  |  | | Yes | | Yes | | Yes | | | Yes | 75 | 0 |
| 3 |  |  | | Yes | | Yes | | Yes | | | Yes |
| 18 |  |  | | Yes | | Yes | | Yes | | |  |
| 42 |  |  | | Yes | | Yes | | Yes | | | Yes |

Table 5.1.1-2: Supported E-UTRA bandwidths per CA configuration for 4DL inter-band CA

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| CA operating / Channel bandwidth | | | | | | | | | | | | | Maximum aggregated bandwidth  [MHz] | Bandwidth Combination Set |
| CA Configuration | E-UTRA Bands | 1.4 MHz | | 3 MHz | | 5 MHz | | 10 MHz | | 15 MHz | 20 MHz | |
| CA\_1A-3A-18A-42C | 1 |  |  | | Yes | | Yes | | Yes | | | Yes | 95 | 0 |
| 3 |  |  | | Yes | | Yes | | Yes | | | Yes |
| 18 |  |  | | Yes | | Yes | | Yes | | |  |
| 42 | See CA\_42C Bandwidth Combination Set 0 in Table 5.6A.1-1 of TS36.101 | | | | | | | | | | |

### 5.1.2 ∆TIB and ∆RIB values

The same ∆TIB and ∆RIB values of CA\_1-3-19-42 specified in TS36.101 can be applied for CA\_1-3-18-42.

Table 5.1.2-1: ΔTIB,c for 4DL aggregation

| **Inter-band CA Configuration** | **E-UTRA Band** | **ΔTIB,c [dB]** |
| --- | --- | --- |
| CA\_1-3-18-42 | 1 | 0.6 |
| 3 | 0.6 |
| 18 | 0.3 |
| 42 | 0.8 |

Table 5.1.2-2: ΔRIB,c for 4DL aggregation

| **Inter-band CA Configuration** | **E-UTRA Band** | **ΔRIB,c [dB]** |
| --- | --- | --- |
| CA\_1-3-18-42 | 1 | 0.2 |
| 3 | 0.2 |
| 18 | 0 |
| 42 | 0.5 |

### 5.1.3 REFSENS requirements

REFSENS requirements of CA\_1A-3A-18A-42A are the same as CA\_1A-3A-19A-42A defined in TS36.101.

Table 5.1.3-1: Reference sensitivity for carrier aggregation QPSK PREFSENS, CA (exceptions due to harmonic issue)

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Channel bandwidth | | | | | | | | |
| EUTRA CA Configuration | EUTRA band | 1.4 MHz (dBm) | 3 MHz (dBm) | 5 MHz (dBm) | 10 MHz (dBm) | 15 MHz (dBm) | 20 MHz (dBm) | Duplex mode |
| CA\_1A-3A-18A-42A9,10  CA\_1A-3A-18A-42C9,10 |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| 4233 |  |  | -71.7 | -71.7 | -71.7 | -71.7 | TDD |
| CA\_1A-3A-18A-42A11  CA\_1A-3A-18A-42C11 |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| 4233 |  |  | -97.1 | -94.7 | -93.2 | -92.5 | TDD |
| NOTE 9: These requirements apply when there is at least one individual RE within the uplink transmission bandwidth of the aggressor (lower) band for which the 2nd transmitter harmonic is within the downlink transmission bandwidth of a victim (higher) band and a range FHD above and below the edge of this downlink transmission bandwidth. The value FHD depends on the E-UTRA configuration: FHD = 10 MHz for CA\_3A-42A, CA\_3A-3A-42A, CA\_3A-42A-42A, CA\_1A-3A-20A-32A-42A, CA\_3A-42A-43A, CA\_3A-32A-42A-43A, CA\_1A-3A-42A, CA\_2A-13A-48A-66A, CA\_2A-48A, CA\_2A-48C, CA\_2A-48D, CA\_48A-66A, CA\_3A-7A-42A, CA\_3A-19A-42A, CA\_3A-20A-42A, CA\_3A-28A-42A, CA\_1A-3A-7A-42A, CA\_13A-48A-66A, CA\_13A-48A-66B, CA\_13A-48A-66C, CA\_13A-48A-48A-66A, CA\_13A-48C-66A, CA\_48A-66A-66A, CA\_48A-66B , CA\_48A-66C, CA\_48A-48A-66A, CA\_48C-66A, CA\_48A-48A-66A-66A, CA\_48A-48A-66B, CA\_48A-48A-66C, CA\_48C-66B, CA\_48C-66C, CA\_48E-66A, CA\_1A-3A-19A-42A, CA\_1A-3A-32A-42A, CA\_3A-7A-20A-42A, CA\_3A-20A-32A-42A, CA\_3A-28A-41A-42A, CA\_1A-3A-18A-42A and CA\_1A-3A-18A-42C. FHD = 0MHz for CA\_11A-28A, CA\_1A-11A-28A and CA\_3A-11A-28A.  NOTE 10: The requirements should be verified for UL EARFCN of the aggressor (lower) band (superscript LB) such that in MHz and  with carrier frequency in the victim (higher) band in MHz and the channel bandwidth configured in the lower band.  NOTE 11: The requirements are only applicable to channel bandwidths with a carrier frequency at  MHz offset from  in the victim (higher band) with , whereandare the channel bandwidths configured in the aggressor (lower) and victim (higher) bands in MHz, respectively.  NOTE 33: Applicable for the operations with 2 or 4 antenna ports supported in the band with carrier aggregation configured. | | | | | | | | |

Table 5.1.3-2: Uplink configuration for the low band (exceptions due to harmonic issue)

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| E-UTRA Band / Channel bandwidth of the high band / NRB / Duplex mode | | | | | | | | |
| EUTRA CA Configuration | UL band | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz | Duplex mode |
| CA\_1A-3A-18A-42A  CA\_1A-3A-18A-42C | 3 |  |  | 12 | 25 | 36 | 50 | FDD |

Table 5.1.3-3: Reference sensitivity for carrier aggregation QPSK PREFSENS, CA (exceptions for four bands due to close proximity of UL to DL channel)

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Channel bandwidth | | | | | | | | |
| EUTRA CA Configuration | EUTRA band | 1.4 MHz (dBm) | 3 MHz (dBm) | 5 MHz (dBm) | 10 MHz (dBm) | 15 MHz (dBm) | 20 MHz (dBm) | Duplex mode |
| CA\_1A-3A-18A-42A  CA\_1A-3A-18A-42C |  |  |  |  |  |  |  | FDD |
| 34,9 |  |  | -93.8 | -91.3 | -89.8 | -88.8 |
| 35 |  |  | -96.8 | -93.8 | -92 | -90.8 |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |
| NOTE 4: These requirements apply when the uplink is active in Band 1 and the separation between the lower edge of the uplink channel in Band 1 and the upper edge of the downlink channel in Band 3 is < 60 MHz. For each channel bandwidth in the bands other than Band 1, the requirement applies regardless of channel bandwidth in Band 1.  NOTE 5: These requirements apply when the uplink is active in Band 1 and the separation between the lower edge of the uplink channel in Band 1 and the upper edge of the downlink channel in Band 3 is ≥ 60 MHz. For each channel bandwidth in the bands other than Band 1, the requirement applies regardless of channel bandwidth in Band 1.  NOTE 9: Applicable for the operations with 2 or 4 antenna ports supported in the band with carrier aggregation configured. | | | | | | | | |

Table 5.1.3-4: Uplink configuration for the low band (exceptions for four bands due to close proximity of UL to DL channel)

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| E-UTRA Band / Channel bandwidth of the affected DL band / NRB / Duplex mode | | | | | | | | |
| **EUTRA CA Configuration** | UL band | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz | Duplex mode |
| CA\_1A-3A-18A-42A  CA\_1A-3A-18A-42C | 11,2 |  |  | 25 | 25 | 25 | 25 | FDD |
| 11,3 |  |  | 25 | 45 | 45 | 45 |
| NOTE 1: refers to the UL resource blocks shall be located as close as possible to the downlink channel in Band 3 but confined within the transmission bandwidth configuration for the channel bandwidth (Table 5.6-1) in the uplink channel in Band 1.  NOTE 2: UL allocation when the separation between the lower edge of the uplink channel in Band 1 and the upper edge of the downlink channel in Band 3 is < 60 MHz  NOTE 3: UL allocation when the separation between the lower edge of the uplink channel in Band 1 and the upper edge of the downlink channel in Band 3 is ≥ 60 MHz. | | | | | | | | |

## 5.2 CA\_1-3-41-42

### 5.2.1 Channel bandwidths per operating band for CA

Table 5.2.1-1: Supported E-UTRA bandwidths per CA configuration for 4DL inter-band CA

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| CA operating / Channel bandwidth | | | | | | | | | | | | | Maximum aggregated bandwidth  [MHz] | Bandwidth Combination Set |
| CA Configuration | E-UTRA Bands | 1.4 MHz | | 3 MHz | | 5 MHz | | 10 MHz | | 15 MHz | 20 MHz | |
| CA\_1A-3A-41A-42A | 1 |  |  | | Yes | | Yes | | Yes | | | Yes | 80 | 0 |
| 3 |  |  | | Yes | | Yes | | Yes | | | Yes |
| 41 |  |  | | Yes | | Yes | | Yes | | | Yes |
| 42 |  |  | | Yes | | Yes | | Yes | | | Yes |

Table 5.2.1-2: Supported E-UTRA bandwidths per CA configuration for 4DL inter-band CA

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| CA operating / Channel bandwidth | | | | | | | | | | | | | Maximum aggregated bandwidth  [MHz] | Bandwidth Combination Set |
| CA Configuration | E-UTRA Bands | 1.4 MHz | | 3 MHz | | 5 MHz | | 10 MHz | | 15 MHz | 20 MHz | |
| CA\_1A-3A-41A-42C | 1 |  |  | | Yes | | Yes | | Yes | | | Yes | 100 | 0 |
| 3 |  |  | | Yes | | Yes | | Yes | | | Yes |
| 41 |  |  | | Yes | | Yes | | Yes | | | Yes |
| 42 | See CA\_42C Bandwidth Combination Set 0 in Table 5.6A.1-1 of TS36.101 | | | | | | | | | | |

Table 5.2.1-3: Supported E-UTRA bandwidths per CA configuration for 4DL inter-band CA

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| CA operating / Channel bandwidth | | | | | | | | | | | | | | | | Maximum aggregated bandwidth  [MHz] | Bandwidth Combination Set |
| CA Configuration | E-UTRA Bands | 1.4 MHz | | | 3 MHz | | 5 MHz | | 10 MHz | | | 15 MHz | 20 MHz | | |
| CA\_1A-3A-41C-42A | 1 |  | |  | | Yes | | Yes | | Yes | | | | Yes | | 100 | 0 |
| 3 |  | |  | | Yes | | Yes | | Yes | | | | Yes | |
| 41 | See CA\_41C Bandwidth Combination Set 0 in Table 5.6A.1-1 of TS36.101 | | | | | | | | | | | | | |
| 42 |  |  | | | Yes | | Yes | | | Yes | | | | Yes |

Table 5.2.1-4: Supported E-UTRA bandwidths per CA configuration for 4DL inter-band CA

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| CA operating / Channel bandwidth | | | | | | | | | | | | | Maximum aggregated bandwidth  [MHz] | Bandwidth Combination Set |
| CA Configuration | E-UTRA Bands | 1.4 MHz | | 3 MHz | | 5 MHz | | 10 MHz | | 15 MHz | 20 MHz | |
| CA\_1A-3A-41C-42C | 1 |  |  | | Yes | | Yes | | Yes | | | Yes | 120 | 0 |
| 3 |  |  | | Yes | | Yes | | Yes | | | Yes |
| 41 | See CA\_41C Bandwidth Combination Set 0 in Table 5.6A.1-1 of TS36.101 | | | | | | | | | | |
| 42 | See CA\_42C Bandwidth Combination Set 0 in Table 5.6A.1-1 of TS36.101 | | | | | | | | | | |

### 5.2.2 ∆TIB and ∆RIB values

For 4DL/1UL CA\_1-3-18-42., the ∆TIB,c and ∆RIB,c values are shown in table 5.2.2-1, and table 5.2.2-2. The values are based on CA\_1-3-42 and CA\_1-41-42 defined in TS36.101.

Table 5.2.2-1: ΔTIB,c for 4DL aggregation

| **Inter-band CA Configuration** | **E-UTRA Band** | **ΔTIB,c [dB]** |
| --- | --- | --- |
| CA\_1-3-41-42 | 1 | 0.6 |
| 3 | 0.6 |
| 41 | 0.5 |
| 42 | 0.8 |

Table 5.2.2-2: ΔRIB,c for 4DL aggregation

| **Inter-band CA Configuration** | **E-UTRA Band** | **ΔRIB,c [dB]** |
| --- | --- | --- |
| CA\_1-3-41-42 | 1 | 0.2 |
| 3 | 0.2 |
| 41 | 0 |
| 42 | 0.5 |

### 5.2.3 REFSENS requirements

REFSENS requirements of CA\_1A-3A-41A-42A are as follows.

Table 5.2.3-1: Reference sensitivity for carrier aggregation QPSK PREFSENS, CA (exceptions due to harmonic issue)

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Channel bandwidth | | | | | | | | |
| EUTRA CA Configuration | EUTRA band | 1.4 MHz (dBm) | 3 MHz (dBm) | 5 MHz (dBm) | 10 MHz (dBm) | 15 MHz (dBm) | 20 MHz (dBm) | Duplex mode |
| CA\_1A-3A-41A-42A9,10  CA\_1A-3A-41A-42C9,10  CA\_1A-3A-41C-42A9,10  CA\_1A-3A-41C-42C9,10 |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| 4233 |  |  | -71.7 | -71.7 | -71.7 | -71.7 | TDD |
| CA\_1A-3A-41A-42A11  CA\_1A-3A-41A-42C11  CA\_1A-3A-41C-42A11 CA\_1A-3A-41C-42C11 |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| 4233 |  |  | -97.1 | -94.7 | -93.2 | -92.5 | TDD |
| NOTE 9: These requirements apply when there is at least one individual RE within the uplink transmission bandwidth of the aggressor (lower) band for which the 2nd transmitter harmonic is within the downlink transmission bandwidth of a victim (higher) band and a range FHD above and below the edge of this downlink transmission bandwidth. The value FHD depends on the E-UTRA configuration: FHD = 10 MHz for CA\_3A-42A, CA\_3A-3A-42A, CA\_3A-42A-42A, CA\_1A-3A-20A-32A-42A, CA\_3A-42A-43A, CA\_3A-32A-42A-43A, CA\_1A-3A-42A, CA\_2A-13A-48A-66A, CA\_2A-48A, CA\_2A-48C, CA\_2A-48D, CA\_48A-66A, CA\_3A-7A-42A, CA\_3A-19A-42A, CA\_3A-20A-42A, CA\_3A-28A-42A, CA\_1A-3A-7A-42A, CA\_13A-48A-66A, CA\_13A-48A-66B, CA\_13A-48A-66C, CA\_13A-48A-48A-66A, CA\_13A-48C-66A, CA\_48A-66A-66A, CA\_48A-66B , CA\_48A-66C, CA\_48A-48A-66A, CA\_48C-66A, CA\_48A-48A-66A-66A, CA\_48A-48A-66B, CA\_48A-48A-66C, CA\_48C-66B, CA\_48C-66C, CA\_48E-66A, CA\_1A-3A-19A-42A, CA\_1A-3A-32A-42A, CA\_3A-7A-20A-42A, CA\_3A-20A-32A-42A, CA\_3A-28A-41A-42A, CA\_1A-3A-18A-42A, CA\_1A-3A-18A-42C, CA\_1A-3A-41A-42A, CA\_1A-3A-41A-42C, CA\_1A-3A-41C-42A and CA\_1A-3A-41C-42C. FHD = 0MHz for CA\_11A-28A, CA\_1A-11A-28A and CA\_3A-11A-28A.  NOTE 10: The requirements should be verified for UL EARFCN of the aggressor (lower) band (superscript LB) such that in MHz and  with carrier frequency in the victim (higher) band in MHz and the channel bandwidth configured in the lower band.  NOTE 11: The requirements are only applicable to channel bandwidths with a carrier frequency at  MHz offset from  in the victim (higher band) with , whereandare the channel bandwidths configured in the aggressor (lower) and victim (higher) bands in MHz, respectively.  NOTE 33: Applicable for the operations with 2 or 4 antenna ports supported in the band with carrier aggregation configured. | | | | | | | | |

Table 5.2.3-2: Uplink configuration for the low band (exceptions due to harmonic issue)

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| E-UTRA Band / Channel bandwidth of the high band / NRB / Duplex mode | | | | | | | | |
| EUTRA CA Configuration | UL band | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz | Duplex mode |
| CA\_1A-3A-41A-42A  CA\_1A-3A-41A-42C  CA\_1A-3A-41C-42A  CA\_1A-3A-41C-42C | 3 |  |  | 12 | 25 | 36 | 50 | FDD |

Table 5.2.3-3: Reference sensitivity for carrier aggregation QPSK PREFSENS, CA (exceptions for four bands due to close proximity of UL to DL channel)

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Channel bandwidth | | | | | | | | |
| EUTRA CA Configuration | EUTRA band | 1.4 MHz (dBm) | 3 MHz (dBm) | 5 MHz (dBm) | 10 MHz (dBm) | 15 MHz (dBm) | 20 MHz (dBm) | Duplex mode |
| CA\_1A-3A-41A-42A  CA\_1A-3A-41A-42C  CA\_1A-3A-41C-42A  CA\_1A-3A-41C-42C |  |  |  |  |  |  |  | FDD |
| 34,9 |  |  | -93.8 | -91.3 | -89.8 | -88.8 |
| 35 |  |  | -96.8 | -93.8 | -92 | -90.8 |
|  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| NOTE 4: These requirements apply when the uplink is active in Band 1 and the separation between the lower edge of the uplink channel in Band 1 and the upper edge of the downlink channel in Band 3 is < 60 MHz. For each channel bandwidth in the bands other than Band 1, the requirement applies regardless of channel bandwidth in Band 1.  NOTE 5: These requirements apply when the uplink is active in Band 1 and the separation between the lower edge of the uplink channel in Band 1 and the upper edge of the downlink channel in Band 3 is ≥ 60 MHz. For each channel bandwidth in the bands other than Band 1, the requirement applies regardless of channel bandwidth in Band 1.  NOTE 9: Applicable for the operations with 2 or 4 antenna ports supported in the band with carrier aggregation configured. | | | | | | | | |

Table 5.2.3-4: Uplink configuration for the low band (exceptions for four bands due to close proximity of UL to DL channel)

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| E-UTRA Band / Channel bandwidth of the affected DL band / NRB / Duplex mode | | | | | | | | |
| **EUTRA CA Configuration** | UL band | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz | Duplex mode |
| CA\_1A-3A-41A-42A  CA\_1A-3A-41A-42C  CA\_1A-3A-41C-42A  CA\_1A-3A-41C-42C | 11,2 |  |  | 25 | 25 | 25 | 25 | FDD |
| 11,3 |  |  | 25 | 45 | 45 | 45 |
| NOTE 1: refers to the UL resource blocks shall be located as close as possible to the downlink channel in Band 3 but confined within the transmission bandwidth configuration for the channel bandwidth (Table 5.6-1) in the uplink channel in Band 1.  NOTE 2: UL allocation when the separation between the lower edge of the uplink channel in Band 1 and the upper edge of the downlink channel in Band 3 is < 60 MHz  NOTE 3: UL allocation when the separation between the lower edge of the uplink channel in Band 1 and the upper edge of the downlink channel in Band 3 is ≥ 60 MHz. | | | | | | | | |

Table 5.2.3-5: Reference sensitivity for carrier aggregation QPSK PREFSENS, CA (exceptions due to cross band isolation issues of TDD and FDD bands)

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| EUTRA CA Configuration | EUTRA band | Channel bandwidth | | | | | | Duplex mode | Applicable active UL band | |
| 1.4 MHz (dBm) | 3 MHz (dBm) | 5 MHz (dBm) | 10 MHz (dBm) | 15 MHz (dBm) | 20 MHz (dBm) |
| CA\_1A-3A-41A-42A12,14  CA\_1A-3A-41A-42C12,14  CA\_1A-3A-41C-42A12,14  CA\_1A-3A-41C-42C12,14 | 319 |  |  | -94 | -91.5 | -90 | -89 | FDD | 1 | |
| 4119 |  |  | -93.3 | -90.7 | -89.2 | -88.1 | TDD |
|  |  |  |  |  |  |  |  | 3 | |
| 4119 |  |  | -93.3 | -90.7 | -89.2 | -88.1 | TDD |
| CA\_1A-3A-41A-42A13,14  CA\_1A-3A-41A-42C13,14  CA\_1A-3A-41C-42A13,14  CA\_1A-3A-41C-42C13,14 | 3 |  |  | -97 | -94 | -92.2 | -91 | FDD | 1 | |
| 4119 |  |  | -93.3 | -90.7 | -89.2 | -88.1 | TDD |
| 1 |  |  | -100 | -97 | -95.2 | -94 | FDD | 3 | |
| 4119 |  |  | -93.3 | -90.7 | -89.2 | -88.1 | TDD |
| NOTE 12: These requirements apply when the uplink is active in Band 1 and the separation between the lower edge of the uplink channel in Band 1 and the upper edge of the downlink channel in Band 3 is < 60 MHz. For each channel bandwidth in Band 3 and Band 41, the requirement applies regardless of channel bandwidth in Band 1.  NOTE 13: These requirements apply when the uplink is active in Band 1 and the separation between the lower edge of the uplink channel in Band 1 and the upper edge of the downlink channel in Band 3 is ≥ 60 MHz. For each channel bandwidth in Band 3 and Band 41, the requirement applies regardless of channel bandwidth in Band 1.  NOTE 14: The B41 requirements also apply to the supported CA\_1A-41A.  NOTE 19: Applicable for the operations with 2 or 4 antenna ports supported in the band with carrier aggregation configured. | | | | | | | | | |

Table 5.2.3-6: Uplink configuration for reference sensitivity (exceptions due to cross band isolation issues of TDD and FDD bands)

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| E-UTRA Band / Channel bandwidth of the affected DL band / NRB / Duplex mode | | | | | | | | |
| EUTRA CA Configuration | E-UTRA Band | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz | Duplex Mode |
| CA\_1A-3A-41A-42A  CA\_1A-3A-41A-42C  CA\_1A-3A-41C-42A  CA\_1A-3A-41C-42C | 1 |  |  | 253 | 251,3 | 251,3 | 251,3 | FDD |
|  |  | 254 | 451,4 | 451,4 | 451,4 | FDD |
| 3 |  |  | 25 | 50 | 501 | 501 | FDD |
| NOTE 1: 1 refers to the UL resource blocks shall be located as close as possible to the downlink operating band but confined within the transmission bandwidth configuration for the channel bandwidth (Table 5.6-1).  NOTE 3: UL allocation when the separation between the lower edge of the uplink channel in Band 1 and the upper edge of the downlink channel in Band 3 is < 60 MHz.  NOTE 4: UL allocation when the separation between the lower edge of the uplink channel in Band 1 and the upper edge of the downlink channel in Band 3 is ≥ 60 MHz. | | | | | | | | |

## 5.3 CA\_1-3-7-8 (including intra-band non-contiguous operation)

### 5.3.1 Channel bandwidths per operating band for CA

Table 5.3.1-2: Supported E-UTRA bandwidths per CA configuration for 5DL/6DL inter-band CA

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| CA operating / Channel bandwidth | | | | | | | | Maximum aggregated bandwidth  [MHz] | Bandwidth Combination Set |
| CA Configuration | E-UTRA Bands | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| CA\_1A-3A-3A-7A-7A-8A | 1 |  |  | Yes | Yes | Yes | Yes | 110 | 0 |
| 3 | See the CA\_3A-3A Bandwidth combination set 0 in Table 5.6A.1-3 of TS 36.101 | | | | | |
| 7 | See the CA\_7A-7A Bandwidth combination set 1 in Table 5.6A.1-3 of TS 36.101 | | | | | |
| 8 |  |  | Yes | Yes |  |  |
| CA\_1A-3A-3A-7A-8A | 1 |  |  | Yes | Yes | Yes | Yes | 90 | 0 |
| 3 | See the CA\_3A-3A Bandwidth combination set 0 in Table 5.6A.1-3 of TS 36.101 | | | | | |
| 7 |  |  | Yes | Yes | Yes | Yes |
| 8 |  |  | Yes | Yes |  |  |
| CA\_1A-3A-7A-7A-8A | 1 |  |  | Yes | Yes | Yes | Yes | 90 | 0 |
| 3 |  |  | Yes | Yes | Yes | Yes |
| 7 | See the CA\_7A-7A Bandwidth combination set 1 in Table 5.6A.1-3 of TS 36.101 | | | | | |
| 8 |  |  | Yes | Yes |  |  |

NOTE: For the UE that signals support of any bandwidth combination set for carrier aggregation, the UE shall support all single carrier bandwidths for the constituent bands as defined in Table 5.6.1-1 of TS 36.101 when operating in single carrier mode.

### 5.3.2 ∆TIB and ∆RIB values

For the UE which supports CA\_1A-3A-3A-7A-7A-8A, CA\_1A-3A-3A-7A-8A, CA\_1A-3A-7A-7A-8A the ΔTIB,c and ΔRIB,c  are defined for applicable bands in Table 5.3.2-1 and 5.3.2-2 respectively.

Table 5.3.2-1: ΔTIB,c (four bands)

|  |  |  |
| --- | --- | --- |
| **E-UTRA operating band combination** | **E-UTRA Band** | **ΔTIB,c [dB]** |
| CA\_1-3-3-7-7-8, CA\_1-3-3-7-8, CA\_1-3-7-7-8 | 1 | 0.6 |
| 3 | 0.6 |
| 7 | 0.6 |
| 8 | 0.6 |

Table 5.3.2-2: ΔRIB,c for (four bands)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **E-UTRA operating band combination** | | **E-UTRA Band** | | **ΔRIB,c [dB]** | |
| CA\_1-3-3-7-7-8, CA\_1-3-3-7-8, CA\_1-3-7-7-8 | | 1 | | 0 | |
| 3 | | 0 | |
| 7 | | 0 | |
| 8 | | 0.2 | |

Note that for the UE which supports CA\_1A-3A-3A-7A-7A-8A, CA\_1A-3A-3A-7A-8A, CA\_1A-3A-7A-7A-8A, the minimum requirements for reference sensitivity of the constituent non-contiguous intra-band combinations with one uplink carrier and two downlink sub-blocks are increased by amount of RIBNC in TS 36.101 Table 7.3.1A-3 and ΔRIB,c in Table 5.3.2-2 for the SCC.

### 5.3.3 REFSENS requirements

Two MSD scenarios need to be specified for these combinations. One is for the Band 8 uplink due to the harmonic interference on Band 7 downlink; the other one is for Band 1 uplink due to the close proximity to band 3 downlink.

The MSD for Band 8 uplink is specified in Table 5.3.3-1 and 5.3.3-2; the MSD for Band 1 uplink is specified in Table 5.3.3-3 and 5.3.3-4.

Table 5.3.3-1: Reference sensitivity for carrier aggregation QPSK PREFSENS, CA (exceptions due to harmonic issue)

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Channel bandwidth | | | | | | | | |
| EUTRA CA Configuration | EUTRA band | 1.4 MHz (dBm) | 3 MHz (dBm) | 5 MHz (dBm) | 10 MHz (dBm) | 15 MHz (dBm) | 20 MHz (dBm) | Duplex mode |
| CA\_1A-3A-3A-7A-7A-8A4, CA\_1A-3A-3A-7A-8A4, CA\_1A-3A-7A-7A-8A4 | 3 |  |  | N/A | N/A | N/A | N/A | FDD |
| CA\_1A-3A-3A-7A-7A-8A4,5,6,CA\_1A-3A-3A-7A-8A4,5,6,CA\_1A-3A-7A-7A-8A4,5,6 | 733 |  |  | -88 | -87.4 | -87 | -86.7 | FDD |
| NOTE 4: No requirements apply when there is at least one individual RE within the uplink transmission bandwidth of the low band for which the 2nd transmitter harmonic is within the downlink transmission bandwidth of the high band. The reference sensitivity is only verified when this is not the case (the requirements specified in clause 7.3.1 apply unless otherwise specified).  NOTE 5: These requirements apply when there is at least one individual RE within the uplink transmission bandwidth of a low band for which the 3rd transmitter harmonic is within the downlink transmission bandwidth of a high band.  NOTE 6: The requirements should be verified for UL EARFCN of a low band (superscript LB) such that in MHz and  with the carrier frequency of a high band in MHz and the channel bandwidth configured in the low band.  NOTE 33: Applicable for the operations with 2 or 4 antenna ports supported in the band with carrier aggregation configured | | | | | | | | |

Table 5.3.3-2: Uplink configuration for the low band (exceptions due to harmonic issue)

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| E-UTRA Band / Channel bandwidth of the high band / NRB / Duplex mode | | | | | | | | |
| EUTRA CA Configuration | UL band | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz | Duplex mode |
| CA\_1A-3A-3A-7A-7A-8A,  CA\_1A-3A-3A-7A-8A,  CA\_1A-3A-7A-7A-8A, | 8 |  |  | 8 | 16 | 25 | 25 | FDD |

Table 5.3.3-3: Reference sensitivity for carrier aggregation QPSK PREFSENS, CA (exceptions for four bands due to close proximity of UL to DL channel)

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Channel bandwidth | | | | | | | | |
| EUTRA CA Configuration | EUTRA band | 1.4 MHz (dBm) | 3 MHz (dBm) | 5 MHz (dBm) | 10 MHz (dBm) | 15 MHz (dBm) | 20 MHz (dBm) | Duplex mode |
| CA\_1A-3A-3A-7A-7A-8A,  CA\_1A-3A-3A-7A-8A,  CA\_1A-3A-7A-7A-8A | 34,9 |  |  | -94 | -91.5 | -90 | -89 | FDD |
| 35 |  |  | -97 | -94 | -92.2 | -91 |
| NOTE 4: These requirements apply when the uplink is active in Band 1 and the separation between the lower edge of the uplink channel in Band 1 and the upper edge of the downlink channel in Band 3 is < 60 MHz. For each channel bandwidth in other than Band 1, the requirement applies regardless of channel bandwidth in Band 1.  NOTE 5: These requirements apply when the uplink is active in Band 1 and the separation between the lower edge of the uplink channel in Band 1 and the upper edge of the downlink channel in Band 3 is ≥ 60 MHz. For each channel bandwidth in other than Band 1, the requirement applies regardless of channel bandwidth in Band 1.  NOTE 9: Applicable for the operations with 2 or 4 antenna ports supported in the band with carrier aggregation configured. | | | | | | | | |

Table 5.3.3-4: Uplink configuration for the low band (exceptions for four bands due to close proximity of UL to DL channel)

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| E-UTRA Band / Channel bandwidth / NRB / Duplex mode | | | | | | | | |
| **EUTRA CA Configuration** | UL band | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz | Duplex mode |
| CA\_1A-3A-3A-7A-7A-8A, CA\_1A-3A-3A-7A-8A, CA\_1A-3A-7A-7A-8A, | 11,2 |  |  | 25 | 25 | 25 | 25 | FDD |
| 11,3 |  |  | 25 | 45 | 45 | 45 |
| NOTE 1: refers to the UL resource blocks shall be located as close as possible to the downlink channel in Band 3 but confined within the transmission bandwidth configuration for the channel bandwidth (Table 5.6-1) in the uplink channel in Band 1.  NOTE 2: UL allocation when the separation between the lower edge of the uplink channel in Band 1 and the upper edge of the downlink channel in Band 3 is < 60 MHz  NOTE 3: UL allocation when the separation between the lower edge of the uplink channel in Band 1 and the upper edge of the downlink channel in Band 3 is ≥ 60 MHz. | | | | | | | | |

## 5.4 CA\_1-3-7-28 (including non-contiguous operation)

### 5.4.1 Channel bandwidths per operating band for CA

Table 5.4.1-1: Supported E-UTRA bandwidths per CA configuration for inter-band CA

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| E-UTRA CA configuration / Bandwidth combination set | | | | | | | | | | |
| E-UTRA CA Configuration | Uplink CA configurations | E-UTRA Bands | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz | Maximum aggregated bandwidth  [MHz] | Bandwidth combination set |
| CA\_1A-3A-7A-7A-28A | - | 1 |  |  | Yes | Yes | Yes | Yes | 100 | 0 |
| 3 |  |  | Yes | Yes | Yes | Yes |
| 7 | See CA\_7A-7A in Table 5.6A.1-3 of 36.101 Bandwidth combination set 3 | | | | | |
| 28 |  |  |  | Yes | Yes | Yes |
| CA\_1A-3C-7A-28A | 3C | 1 |  |  | Yes | Yes | Yes | Yes | 100 | 0 |
| 3 | See CA\_3C Bandwidth combination set 0 in Table 5.6A.1-1 | | | | | |
| 7 |  |  |  | Yes | Yes | Yes |
| 28 |  |  | Yes | Yes | Yes | Yes |
| CA\_1A-3C-7C-28A | 3C  7C | 1 |  |  | Yes | Yes | Yes | Yes | 120 | 0 |
| 3 | See CA\_3C Bandwidth combination set 0 in Table 5.6A.1-1 | | | | | |
| 7 | See CA\_7C Bandwidth Combination Set 2 in Table 5.6A.1-1 | | | | | |
| 28 |  |  | Yes | Yes | Yes | Yes |
| CA\_1A-1A-3A-7A-28A | - | 1 | See CA\_1A-1A Bandwidth Combination Set 0 in Table 5.6A.1-3 | | | | | | 100 | 0 |
| 3 |  |  | Yes | Yes | Yes | Yes |
| 7 |  |  |  | Yes | Yes | Yes |
| 28 |  |  | Yes | Yes | Yes | Yes |
| CA\_1A-1A-3A-7C-28A | CA\_7C | 1 | See CA\_1A-1A Bandwidth Combination Set 0 in Table 5.6A.1-3 | | | | | | 120 | 0 |
| 3 |  |  | Yes | Yes | Yes | Yes |
| 7 | See CA\_7C Bandwidth combination set 2 in Table 5.6A.1-1 | | | | | |
| 28 |  |  | Yes | Yes | Yes | Yes |
| CA\_1A-1A-3C-7A-28A | CA\_3C | 1 | See CA\_1A-1A Bandwidth Combination Set 0 in Table 5.6A.1-3 | | | | | | 120 | 0 |
| 3 | See CA\_3C Bandwidth combination set 0 in Table 5.6A.1-1 | | | | | |
| 7 |  |  |  | Yes | Yes | Yes |
| 28 |  |  | Yes | Yes | Yes | Yes |
| CA\_1A-1A-3C-7C-28A | CA\_3C CA\_7C | 1 | See CA\_1A-1A Bandwidth Combination Set 0 in Table 5.6A.1-3 | | | | | | 140 | 0 |
| 3 | See CA\_3C Bandwidth combination set 0 in Table 5.6A.1-1 | | | | | |
| 7 | See CA\_7C Bandwidth combination set 2 in Table 5.6A.1-1 | | | | | |
| 28 |  |  | Yes | Yes | Yes | Yes |
| CA\_1A-3A-3A-7C-28A | CA\_7C | 1 |  |  | Yes | Yes | Yes | Yes | 120 | 0 |
| 3 | See CA\_3A-3A Bandwidth Combination Set 0 in Table 5.6A.1-3 | | | | | |
| 7 | See CA\_7C Bandwidth combination set 2 in Table 5.6A.1-1 | | | | | |
| 28 |  |  | Yes | Yes | Yes | Yes |
| CA\_1A-1A-3A-3A-7A-28A | - | 1 | See CA\_1A-1A Bandwidth Combination Set 0 in Table 5.6A.1-3 | | | | | | 120 | 0 |
| 3 | See CA\_3A-3A Bandwidth Combination Set 0 in Table 5.6A.1-3 | | | | | |
| 7 |  |  |  | Yes | Yes | Yes |
| 28 |  |  | Yes | Yes | Yes | Yes |
| CA\_1A-1A-3A-3A-7C-28A | CA\_7C | 1 | See CA\_1A-1A Bandwidth Combination Set 0 in Table 5.6A.1-3 | | | | | | 140 | 0 |
| 3 | See CA\_3A-3A Bandwidth Combination Set 0 in Table 5.6A.1-3 | | | | | |
| 7 | See CA\_7C Bandwidth combination set 2 in Table 5.6A.1-1 | | | | | |
| 28 |  |  | Yes | Yes | Yes | Yes |

### 5.4.2 ΔTIB,c and ΔRIB,c values

The ΔTIB,c and ΔRIB,c values for four band CA\_1-3-7-28 are covered in TS 36.101 Table 6.2.5-4 (four bands) for ΔTIB,c and Table 7.3.1-1C (four bands) for ΔRIB,c.

### 5.4.3 REFSENS requirements

Reference sensitivity requirements follow those already specified for CA\_1A-3A-7A-28A in TS 36.101.

## 5.5 CA\_3-28-41-42

### 5.5.1 Channel bandwidths per operating band for CA

Table 5.5.1-1: E-UTRA CA configurations and bandwidth combination sets defined for inter-band CA

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| E-UTRA CA configuration / Bandwidth combination set | | | | | | | | | | |
| E-UTRA CA Configuration | Uplink CA configurations | E-UTRA Bands | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz | Maximum aggregated bandwidth  [MHz] | Bandwidth combination set |
| CA\_3A-28A-41C-42C | - | 3 |  |  | Yes | Yes | Yes | Yes | 110 | 0 |
| 28 |  |  | Yes | Yes |  |  |
| 41 | See the CA\_41C Bandwidth combination set 0 in Table 5.6A.1-1 | | | | | |
| 42 | See the CA\_42C Bandwidth combination set 1 in Table 5.6A.1-1 | | | | | |

### 5.5.2 ∆TIB and ∆RIB values

Since delta TIB and RIB have been studied in lower order CAs of CA\_3-28-41-42, this CA combination can reuse the results. Thus there is no need to specify a new requirement.

### 5.5.3 REFSENS requirements

Since REFSENS exception has been studied in lower order CAs of CA\_3-28-41-42, this CA combination can reuse the results. Thus there is no need to specify a new requirement.

## 5.6 CA\_3-7-32-46

### 5.6.1 Channel bandwidths per operating band for CA

Table 5.6.1-1: E-UTRA CA configurations and bandwidth combination sets defined for inter-band CA: 3A-7A-32A-46A

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| CA operating / channel bandwidth | | | | | | | | Maximum aggregated bandwidth  [MHz] | Bandwidth Combination Set |
| E-UTRA CA Configuration | E-UTRA Bands | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| CA\_3A-7A-32A-46A | 3 |  |  | Yes | Yes | Yes | Yes | 80 | 0 |
| 7 |  |  |  | Yes | Yes | Yes |
| 32 |  |  | Yes | Yes | Yes | Yes |
| 46 |  |  |  |  |  | Yes |

Table 5.6.1-2: E-UTRA CA configurations and bandwidth combination sets defined for inter-band CA: 3A-7A-32A-46C

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| CA operating / channel bandwidth | | | | | | | | Maximum aggregated bandwidth  [MHz] | Bandwidth Combination Set |
| E-UTRA CA Configuration | E-UTRA Bands | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| CA\_3A-7A-32A-46C | 3 |  |  | Yes | Yes | Yes | Yes | 100 | 0 |
| 7 |  |  |  | Yes | Yes | Yes |
| 32 |  |  | Yes | Yes | Yes | Yes |
| 46 | See CA\_46C in Table 5.6A.1-1 of TS 36.101 Bandwidth Combination Set 0 | | | | | |

Table 5.6.1-3: E-UTRA CA configurations and bandwidth combination sets defined for inter-band CA: 3A-7A-32A-46D

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| CA operating / channel bandwidth | | | | | | | | Maximum aggregated bandwidth  [MHz] | Bandwidth Combination Set |
| E-UTRA CA Configuration | E-UTRA Bands | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| CA\_3A-7A-32A-46D | 3 |  |  | Yes | Yes | Yes | Yes | 120 | 0 |
| 7 |  |  |  | Yes | Yes | Yes |
| 32 |  |  | Yes | Yes | Yes | Yes |
| 46 | See CA\_46D in Table 5.6A.1-1 of TS 36.101 Bandwidth Combination Set 0 | | | | | |

Table 5.6.1-4: E-UTRA CA configurations and bandwidth combination sets defined for inter-band CA: 3A-7A-32A-46E

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| CA operating / channel bandwidth | | | | | | | | Maximum aggregated bandwidth  [MHz] | Bandwidth Combination Set |
| E-UTRA CA Configuration | E-UTRA Bands | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| CA\_3A-7A-32A-46E | 3 |  |  | Yes | Yes | Yes | Yes | 140 | 0 |
| 7 |  |  |  | Yes | Yes | Yes |
| 32 |  |  | Yes | Yes | Yes | Yes |
| 46 | See CA\_46E in Table 5.6A.1-1 of TS 36.101 Bandwidth Combination Set 0 | | | | | |

### 5.6.2 ∆TIB and ∆RIB values

Table 5.6.2-1: ΔTIB,c due to CA (4 bands)

|  |  |  |
| --- | --- | --- |
| **Inter-band CA Configuration** | **E-UTRA and NR Band** | **ΔTIB,c [dB]** |
| CA\_3-7-32-46 | 3 | 0.7 |
| 7 | 0.7 |

**Table 5.6.2-2: ΔRIB,c due to CA (4 bands)**

|  |  |  |
| --- | --- | --- |
| **Inter-band CA Configuration** | **E-UTRA and NR Band** | **ΔRIB [dB]** |
| CA\_3-7-32-46 | 3 | 0 |
| 7 | 0 |
| 32 | 0 |

### 5.6.3 REFSENS requirements

Table 5.6.3-1: Reference sensitivity QPSK PREFSENS

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Channel bandwidth | | | | | | | |
| E-UTRA Band | 1.4 MHz (dBm) | 3 MHz (dBm) | 5 MHz (dBm) | 10 MHz (dBm) | 15 MHz (dBm) | 20 MHz (dBm) | Duplex Mode |
| 3 |  |  | -97 | -94 | -92.2 | -91 | FDD |
| 7 |  |  |  | -95 | -93.2 | -92 | FDD |
| 32 |  |  | -100 | -97 | -95.2 | -94 | SDL |
| 46 |  |  |  |  |  | -90 | TDD |

## 5.7 CA\_1-3-7-38

### 5.7.1 Channel bandwidths per operating band for CA

Channel bandwidths for CA\_1-3-7-38 defined in TS 36.101 like below, in which NOTE 12 and 13 of Table 7.3.1A-0bE are revised.

Table 5.6A.1-2b: E-UTRA CA configurations and bandwidth combination sets defined for inter-band CA (four bands)

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| E-UTRA CA configuration / Bandwidth combination set | | | | | | | | | | |
| E-UTRA CA Configuration | Uplink CA configurations | E-UTRA Bands | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz | Maximum aggregated bandwidth  [MHz] | Bandwidth combination set |
| CA\_1A-3A-7A-38A9 | - | 1 |  |  | Yes | Yes | Yes | Yes | 80 | 0 |
| 3 |  |  | Yes | Yes | Yes | Yes |
| 7 |  |  | Yes | Yes | Yes | Yes |
| 38 |  |  | Yes | Yes | Yes | Yes |
| CA\_1A-3C-7A-38A9 | - | 1 |  |  | Yes | Yes | Yes | Yes | 100 | 0 |
| 1. 3 | See CA\_3C Bandwidth combination set 0 in 36.101 Table 5.6A.1-1 | | | | | |
| 7 |  |  | Yes | Yes | Yes | Yes |
| 38 |  |  | Yes | Yes | Yes | Yes |
| NOTE 9: UL carrier shall be supported in Band 1, 3, 8 or 28 only. Power imbalance between downlink carriers on Band 7 and Band 38 is assumed to be within [6dB]. | | | | | | | | | | |

### 5.7.2 ΔTIB,c and ΔRIB,c values

It is assumed that band 41 filter is used for 7+38, therefore ΔRIB,c values for CA\_1-3-7-38 are derived from CA\_1-3-41. For the ΔTIB,c the (maximum) values from CA\_1-3-7 and CA 1-3-38 are used. Values will be defined in the following tables in TS 36.101.

Table 6.2.5-4: ΔTIB,c (four bands)

|  |  |  |
| --- | --- | --- |
| E-UTRA operating band combination | E-UTRA Band | ΔTIB,c [dB] |
| CA\_1-3-7-38 | 1 | 0.6 |
| 3 | 0.6 |

Table 7.3.1-1C: ΔRIB,c (four bands)

|  |  |  |
| --- | --- | --- |
| E-UTRA operating band combination | E-UTRA Band | ΔRIB,c [dB] |
| CA\_1-3-7-38 | 1 | 0 |
| 3 | 0 |
| 7 | 0 |
| 38 | 0 |

### 5.7.3 REFSENS requirements

The REFSENS requirements for CA\_1A-3A-7A-38A and CA\_1A-3C-7A-38A need to be added in TS 36.101 as in tables below:

Table 7.3.1A-0bD1: Reference sensitivity for carrier aggregation QPSK PREFSENS, CA (exceptions for four bands due to close proximity of UL to DL channel)

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Channel bandwidth | | | | | | | | |
| EUTRA CA Configuration | EUTRA band | 1.4 MHz (dBm) | 3 MHz (dBm) | 5 MHz (dBm) | 10 MHz (dBm) | 15 MHz (dBm) | 20 MHz (dBm) | Duplex mode |
| CA\_1A-3A-7A-38A  CA\_1A-3C-7A-38A | 34,9 |  |  | -93.8 | -91.3 | -89.8 | -88.8 | FDD |
| 35 |  |  | -96.8 | -93.8 | -92 | -90.8 |
| NOTE 4: These requirements apply when the uplink is active in Band 1 and the separation between the lower edge of the uplink channel in Band 1 and the upper edge of the downlink channel in Band 3 is < 60 MHz. For each channel bandwidth in the bands other than Band 1, the requirement applies regardless of channel bandwidth in Band 1.  NOTE 5: These requirements apply when the uplink is active in Band 1 and the separation between the lower edge of the uplink channel in Band 1 and the upper edge of the downlink channel in Band 3 is ≥ 60 MHz. For each channel bandwidth in the bands other than Band 1, the requirement applies regardless of channel bandwidth in Band 1.  NOTE 9: Applicable for the operations with 2 or 4 antenna ports supported in the band with carrier aggregation configured. | | | | | | | | |

Table 7.3.1A-0bD2: Uplink configuration for the low band (exceptions for four bands due to close proximity of UL to DL channel)

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| E-UTRA Band / Channel bandwidth of the affected DL band / NRB / Duplex mode | | | | | | | | |
| **EUTRA CA Configuration** | UL band | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz | Duplex mode |
| CA\_1A-3A-7A-38A  CA\_1A-3C-7A-38A | 11,2 |  |  | 25 | 25 | 25 | 25 | FDD |
| 11,3 |  |  | 25 | 45 | 45 | 45 |
| NOTE 1: refers to the UL resource blocks shall be located as close as possible to the downlink channel in Band 3 but confined within the transmission bandwidth configuration for the channel bandwidth (Table 5.6-1) in the uplink channel in Band 1.  NOTE 2: UL allocation when the separation between the lower edge of the uplink channel in Band 1 and the upper edge of the downlink channel in Band 3 is < 60 MHz  NOTE 3: UL allocation when the separation between the lower edge of the uplink channel in Band 1 and the upper edge of the downlink channel in Band 3 is ≥ 60 MHz. | | | | | | | | |

Table 7.3.1A-0bE: Reference sensitivity for carrier aggregation QPSK PREFSENS, CA (exceptions due to cross band isolation issues of TDD and FDD bands)

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| EUTRA CA Configuration | EUTRA band | Channel bandwidth | | | | | | Duplex mode | Applicable active UL band |
| 1.4 MHz (dBm) | 3 MHz (dBm) | 5 MHz (dBm) | 10 MHz (dBm) | 15 MHz (dBm) | 20 MHz (dBm) |
| CA\_1A-3A-7A-38A  CA\_1A-3C-7A-38A | 719 |  |  | -93.3 | -90.7 | -89.2 | -88.1 | FDD | 1 |
| 3819 |  |  | -93.3 | -90.7 | -89.2 | -88.1 | TDD |
| CA\_1A-3A-7A-38A  CA\_1A-3C-7A-38A | 719 |  |  | -93.3 | -90.7 | -89.2 | -88.1 | FDD | 3 |
| 3819 |  |  | -93.3 | -90.7 | -89.2 | -88.1 | TDD |
| NOTE 19: Applicable for the operations with 2 or 4 antenna ports supported in the band with carrier aggregation configured. | | | | | | | | | |

Table 7.3.1A-0bF: Uplink configuration for reference sensitivity (exceptions due to cross band isolation issues of TDD and FDD bands)

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| E-UTRA Band / Channel bandwidth of the affected DL band / NRB / Duplex mode | | | | | | | | |
| EUTRA CA Configuration | E-UTRA Band | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz | Duplex Mode |
| CA\_1A-3A-7A-38A  CA\_1A-3C-7A-38A | 1 |  |  | 25 | 50 | 75 | 100 | FDD |
| 3 |  |  | 25 | 50 | 501 | 501 | FDD |
| NOTE 1: 1 refers to the UL resource blocks shall be located as close as possible to the downlink operating band but confined within the transmission bandwidth configuration for the channel bandwidth (Table 5.6-1). | | | | | | | | |

## 5.8 CA\_2-46-48-66

### 5.8.1 Channel bandwidths per operating band for CA

Table 5.8.1-1: Supported E-UTRA bandwidths per CA configuration for 3-band DL inter-band CA

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| CA operating / Channel bandwidth | | | | | | | | | |
| CA Configuration | E-UTRA Bands | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz | **Maximum aggregated bandwidth**  [MHz] | Bandwidth Combination Set |
| CA\_2A-46E-48A-66A | 2 |  |  | Yes | Yes | Yes | Yes | 140 | 0 |
| 46 | See CA\_46E Bandwidth combination set 0 in  Table 5.6A.1-1 | | | | | |
| 48 |  |  | Yes | Yes | Yes | Yes |
| 66 |  |  | Yes | Yes | Yes | Yes |

### 5.8.2 ∆TIB and ∆RIB values

The ∆TIB and ∆RIB values of CA\_2-46-48-66 is already specified in TS36.101.

### 5.8.3 REFSENS requirements

REFSENS requirements of CA\_2A-46D-48A-66A defined in TS36.101 can be applied for CA\_2A-46E-48A-66A.

Table 5.8.3-1: Reference sensitivity QPSK PREFSENS (CA with band 46 or Band 49)

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Channel bandwidth | | | | | | | | |
| EUTRA CA Configuration | EUTRA band | 1.4 MHz  (dBm) | 3 MHz  (dBm) | 5 MHz  (dBm) | 10 MHz  (dBm) | 15 MHz  (dBm) | 20 MHz  (dBm) | Duplex mode |
| CA\_2A-46E-48A-66A10,11 | 2 |  |  | -97.7 | -94.7 | -92.9 | -91.7 | FDD |
| 46 |  |  |  |  |  | -83 | TDD |
| 48 |  |  | -71.7 | -71.7 | -71.7 | -71.7 | TDD |
| 66 |  |  | -99.3 | -96.3 | -94.5 | -93.3 | FDD |
| CA\_2A-46E-48A-66A12 | 2 |  |  | -97.7 | -94.7 | -92.9 | -91.7 | FDD |
| 46 |  |  |  |  |  | -83 | TDD |
| 48 |  |  | -97.1 | -94.7 | -93.2 | -92.5 | TDD |
| 66 |  |  | -99.3 | -96.3 | -94.5 | -93.3 | FDD |
| NOTE 10: These requirements apply when there is at least one individual RE within the uplink transmission bandwidth of the aggressor (lower) band for which the 2nd transmitter harmonic is within the downlink transmission bandwidth of a victim (higher) band which excludes band 46 and a range FHD above and below the edge of this downlink transmission bandwidth. The value FHD depends on the E-UTRA configuration: FHD = 10 MHz for CA\_2-46-48, CA\_46-48-66, and CA\_2-46-48-66. For harmonic issue not related with band 46, the uplink configuration of CA\_2-48, CA\_48-66 and CA\_2-48-66 in Table 7.3.1A-0b can be used.  NOTE 11: The requirements should be verified for UL EARFCN of the aggressor (lower) band (superscript LB) such that in MHz and  with carrier frequency in the victim (higher) band in MHz and the channel bandwidth configured in the lower band.  NOTE 12: The requirements are only applicable to channel bandwidths with a carrier frequency at  MHz offset from  in the victim (higher band) with , whereandare the channel bandwidths configured in the aggressor (lower) and victim (higher) bands in MHz, respectively.  IMD frequency range   |  |  |  |  | | --- | --- | --- | --- | | DL\_CA configuration | UL\_CA configuration | Exclusion zone center frequency | Exclusion zone BW | | CA\_1A-5A-46A | CA\_1A-5A | 2\*fc\_1A + 2\*fc\_5A | 2\*BW\_1A + 2\*BW\_5A | | CA\_1A-7A-46A | CA\_1A-7A | 3\*fc\_7A - fc\_1A | 3\*BW\_7A + BW\_1A | | CA\_5A-7A-46A | CA\_5A-7A | 2\*fc\_7A + fc\_5A | 2\*BW\_7A + BW\_5A | | | | | | | | | |

## 5.9 CA\_2-5-46-66

### 5.9.1 Channel bandwidths per operating band for CA

Table 5.9.1-1: Supported E-UTRA bandwidths per CA configuration for 4-band DL inter-band CA

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| CA operating / Channel bandwidth | | | | | | | | | |
| CA Configuration | E-UTRA Bands | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz | Maximum aggregated bandwidth  [MHz] | Bandwidth Combination Set |
| CA\_2A-5A-46A-66A | 2 |  |  | Yes | Yes | Yes | Yes | 70 | 0 |
| 5 |  |  | Yes | Yes |  |  |
| 46 |  |  |  |  |  | Yes |
| 66 |  |  | Yes | Yes | Yes | Yes |
| CA\_2A-5A-46C-66A | 2 |  |  | Yes | Yes | Yes | Yes | 90 | 0 |
| 5 |  |  | Yes | Yes |  |  |
| 46 | See CA\_46C Bandwidth combination set 0 in  Table 5.6A.1-1 of 36.101 | | | | | |
| 66 |  |  | Yes | Yes | Yes | Yes |
| CA\_2A-5A-46D-66A | 2 |  |  | Yes | Yes | Yes | Yes | 110 | 0 |
| 5 |  |  | Yes | Yes |  |  |
| 46 | See CA\_46D Bandwidth combination set 0 in  Table 5.6A.1-1 of 36.101 | | | | | |
| 66 |  |  | Yes | Yes | Yes | Yes |
| CA\_2A-5A-46E-66A | 2 |  |  | Yes | Yes | Yes | Yes | 130 | 0 |
| 5 |  |  | Yes | Yes |  |  |
| 46 | See CA\_46E Bandwidth combination set 0 in  Table 5.6A.1-1 of 36.101 | | | | | |
| 66 |  |  | Yes | Yes | Yes | Yes |
| CA\_2A-5A-46A-66A-66A | 2 |  |  | Yes | Yes | Yes | Yes | 90 | 0 |
| 5 |  |  | Yes | Yes |  |  |
| 46 |  |  |  |  |  | Yes |
| 66 | See CA\_66A-66A Bandwidth combination set 0 in Table 5.6A.1-3 | | | | | |
| CA\_2A-5A-46C-66A-66A | 2 |  |  | Yes | Yes | Yes | Yes | 110 | 0 |
| 5 |  |  | Yes | Yes |  |  |
| 46 | See CA\_46C Bandwidth combination set 0 in  Table 5.6A.1-1 of 36.101 | | | | | |
| 66 | See CA\_66A-66A Bandwidth combination set 0 in Table 5.6A.1-3 | | | | | |
| CA\_2A-5A-46D-66A-66A | 2 |  |  | Yes | Yes | Yes | Yes | 130 | 0 |
| 5 |  |  | Yes | Yes |  |  |
| 46 | See CA\_46D Bandwidth combination set 0 in  Table 5.6A.1-1 of 36.101 | | | | | |
| 66 | See CA\_66A-66A Bandwidth combination set 0 in Table 5.6A.1-3 | | | | | |

### 5.9.2 ∆TIB and ∆RIB values

The ∆TIB and ∆RIB values of CA\_2-5-66 are specified in TS36.101 and are applied to CA\_2-5-46-66 and CA\_2-5-46-66-66.

Table 5.1.2-1: ΔTIB,c for 3DL aggregation

| Inter-band CA Configuration | E-UTRA Band | ΔTIB,c [dB] |
| --- | --- | --- |
| CA\_2-5-46-66, CA\_2-5-46-66-66 | 2 | 0.5 |
| 5 | 0.3 |
| 66 | 0.5 |

Table 5.1.2-2: ΔRIB,c for 3DL aggregation

| **Inter-band CA Configuration** | **E-UTRA Band** | **ΔRIB,c [dB]** |
| --- | --- | --- |
| CA\_2-5-46-66, CA\_2-5-46-66-66 | 2 | 0.3 |
| 5 | 0 |
| 66 | 0.3 |

### 5.9.3 REFSENS requirements

REFSENS requirements of CA\_2A-46A-66A and **CA\_2A-5A-46A** are defined in TS36.101 and can be applied for CA\_2-5-46-66 and CA\_2-5-46-66-66.

Table 5.9.3-1: Reference sensitivity QPSK PREFSENS (CA with band 46 or Band 49)

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Channel bandwidth | | | | | | | | |
| EUTRA CA Configuration | EUTRA band | 1.4 MHz  (dBm) | 3 MHz  (dBm) | 5 MHz  (dBm) | 10 MHz  (dBm) | 15 MHz  (dBm) | 20 MHz  (dBm) | Duplex mode |
| CA\_2A-5A-46A-66A  CA\_2A-5A-46C-66A  CA\_2A-5A-46D-66A  CA\_2A-5A-46E-66A  CA\_2A-5A-46A-66A-66A  CA\_2A-5A-46C-66A-66A  CA\_2A-5A-46D-66A-66A | 2 |  |  | -98 | -95 | -93.2 | -92 | FDD |
| 5 |  |  | -98 | -95 |  |  | FDD |
| 46 |  |  |  |  |  | -90 | TDD |
| 66 |  |  | -99.5 | -96.5 | -94.7 | -93.5 | FDD |

## 5.10 CA\_2-13-46-66

### 5.10.1 Channel bandwidths per operating band for CA

Table 5.10.1-1: Supported E-UTRA bandwidths per CA configuration for 4-band DL inter-band CA

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| CA operating / Channel bandwidth | | | | | | | | | |
| CA Configuration | E-UTRA Bands | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz | Maximum aggregated bandwidth  [MHz] | Bandwidth Combination Set |
| CA\_2A-13A-46A-66A | 2 |  |  | Yes | Yes | Yes | Yes | 70 | 0 |
| 13 |  |  | Yes | Yes |  |  |
| 46 |  |  |  |  |  | Yes |
| 66 |  |  | Yes | Yes | Yes | Yes |
| CA\_2A-13A-46C-66A | 2 |  |  | Yes | Yes | Yes | Yes | 90 | 0 |
| 13 |  |  | Yes | Yes |  |  |
| 46 | See CA\_46C Bandwidth combination set 0 in  Table 5.6A.1-1 of 36.101 | | | | | |
| 66 |  |  | Yes | Yes | Yes | Yes |
| CA\_2A-13A-46D-66A | 2 |  |  | Yes | Yes | Yes | Yes | 110 | 0 |
| 13 |  |  | Yes | Yes |  |  |
| 46 | See CA\_46D Bandwidth combination set 0 in  Table 5.6A.1-1 of 36.101 | | | | | |
| 66 |  |  | Yes | Yes | Yes | Yes |
| CA\_2A-5A-46E-66A | 2 |  |  | Yes | Yes | Yes | Yes | 130 | 0 |
| 5 |  |  | Yes | Yes |  |  |
| 46 | See CA\_46E Bandwidth combination set 0 in  Table 5.6A.1-1 of 36.101 | | | | | |
| 66 |  |  | Yes | Yes | Yes | Yes |
| CA\_2A-13A-46A-66A-66A | 2 |  |  | Yes | Yes | Yes | Yes | 90 | 0 |
| 13 |  |  | Yes | Yes |  |  |
| 46 |  |  |  |  |  | Yes |
| 66 | See CA\_66A-66A Bandwidth combination set 0 in Table 5.6A.1-3 | | | | | |
| CA\_2A-13A-46C-66A-66A | 2 |  |  | Yes | Yes | Yes | Yes | 110 | 0 |
| 13 |  |  | Yes | Yes |  |  |
| 46 | See CA\_46C Bandwidth combination set 0 in  Table 5.6A.1-1 of 36.101 | | | | | |
| 66 | See CA\_66A-66A Bandwidth combination set 0 in Table 5.6A.1-3 | | | | | |
| CA\_2A-13A-46D-66A-66A | 2 |  |  | Yes | Yes | Yes | Yes | 130 | 0 |
| 13 |  |  | Yes | Yes |  |  |
| 46 | See CA\_46D Bandwidth combination set 0 in  Table 5.6A.1-1 of 36.101 | | | | | |
| 66 | See CA\_66A-66A Bandwidth combination set 0 in Table 5.6A.1-3 | | | | | |

### 5.10.2 ∆TIB and ∆RIB values

The ∆TIB and ∆RIB values of CA\_2-13-66 are specified in TS36.101 and are applied to CA\_2-13-46-66 and CA\_2-13-46-66-66.

Table 5.1.2-1: ΔTIB,c for 3DL aggregation

| Inter-band CA Configuration | E-UTRA Band | ΔTIB,c [dB] |
| --- | --- | --- |
| CA\_2-13-46-66, CA\_2-13-46-66-66 | 2 | 0.5 |
| 13 | 0.3 |
| 66 | 0.5 |

Table 5.1.2-2: ΔRIB,c for 3DL aggregation

| Inter-band CA Configuration | E-UTRA Band | ΔRIB,c [dB] |
| --- | --- | --- |
| CA\_2-13-46-66, CA\_2-13-46-66-66 | 2 | 0.3 |
| 13 | 0 |
| 66 | 0.3 |

### 5.10.3 REFSENS requirements

REFSENS requirements of CA\_2A-46A-66A and CA\_2A-13A-46A are defined in TS36.101 and can be applied for CA\_2-5-46-66 and CA\_2-5-46-66-66.

Table 5.10.3-1: Reference sensitivity QPSK PREFSENS (CA with band 46 or Band 49)

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Channel bandwidth | | | | | | | | |
| EUTRA CA Configuration | EUTRA band | 1.4 MHz  (dBm) | 3 MHz  (dBm) | 5 MHz  (dBm) | 10 MHz  (dBm) | 15 MHz  (dBm) | 20 MHz  (dBm) | Duplex mode |
| CA\_2A-13A-46A-66A  CA\_2A-13A-46C-66A  CA\_2A-13A-46D-66A  CA\_2A-13A-46A-66A-66A  CA\_2A-13A-46C-66A-66A  CA\_2A-13A-46D-66A-66A | 2 |  |  | -98 | -95 | -93.2 | -92 | FDD |
| 13 |  |  | -97 | -94 |  |  | FDD |
| 46 |  |  |  |  |  | -90 | TDD |
| 66 |  |  | -99.5 | -96.5 | -94.7 | -93.5 | FDD |

## 5.11 CA\_3-7-28-40

### 5.11.1 Channel bandwidths per operating band for CA

Table 5.11.1-1: Supported E-UTRA bandwidths per CA configuration for 4DL inter-band CA

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| E-UTRA CA configuration / Bandwidth combination set | | | | | | | | | | |
| E-UTRA CA Configuration | Uplink CA configurations | E-UTRA Bands | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz | Maximum aggregated bandwidth  [MHz] | Bandwidth combination set |
| CA\_3A-7A-28A-40A | - | 3 |  |  | Yes | Yes | Yes | Yes | 80 | 0 |
| 7 |  |  |  | Yes | Yes | Yes |
| 28 |  |  | Yes | Yes | Yes | Yes |
| 40 |  |  | Yes | Yes | Yes | Yes |
| CA\_3A-7A-28A-40C | - | 3 |  |  | Yes | Yes | Yes | Yes | 100 | 0 |
| 7 |  |  |  | Yes | Yes | Yes |
| 28 |  |  | Yes | Yes | Yes | Yes |
| 40 | See CA\_40C Bandwidth combination set 0 in Table 5.6A.1-1 | | | | | |
|  | | | | | | | | | | |

### 5.11.2 ΔTIB,c and ΔRIB,c values

ΔRIB,c values for CA\_3-7-28-40 are derived from CA\_3-7-40 and CA 7-28-40. For the ΔTIB,c the (maximum) values from CA\_3-7-40 and CA\_7-28-40 are used. Values will be defined in the following tables in TS 36.101.

Table 5.11.2-1: ΔTIB,c (four bands)

|  |  |  |
| --- | --- | --- |
| E-UTRA operating band combination | E-UTRA Band | ΔTIB,c [dB] |
| CA\_3-7-28-40 | 3 | 0.6 |
| 7 | 0.8 |
| 28 | 0.3 |
| 40 | 0.9 |

Table 5.11.2-2: ΔRIB,c (four bands)

|  |  |  |
| --- | --- | --- |
| E-UTRA operating band combination | E-UTRA Band | ΔRIB,c [dB] |
| CA\_3-7-28-40 | 3 | 0 |
| 7 | 0.3 |
| 28 | 0 |
| 40 | 0.8 |

### 5.11.3 REFSENS requirements

The REFSENS requirements for CA\_3A-7A-28A-40A and CA\_3A-7A-28A-40C need to be added in TS 36.101 as in tables below:

Table 7.3.1A-0a: Reference sensitivity for carrier aggregation QPSK PREFSENS, CA (exceptions due to harmonic issue)

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Channel bandwidth | | | | | | | | |
| EUTRA CA Configuration | EUTRA band | 1.4 MHz (dBm) | 3 MHz (dBm) | 5 MHz (dBm) | 10 MHz (dBm) | 15 MHz (dBm) | 20 MHz (dBm) | Duplex mode |
| CA\_3A-7A-28A-40A15,16  CA\_3A-7A-28A-40C 15,16 | 28 |  |  | -60.7 | -60.7 | -60.7 | -60.7 | FDD |

Table 7.3.1A-0b: Uplink configuration for the low band (exceptions due to harmonic issue)

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| E-UTRA Band / Channel bandwidth of the high band / NRB / Duplex mode | | | | | | | | |
| EUTRA CA Configuration | UL band | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz | Duplex mode |
| CA\_3A-7A-28A-40A  CA\_3A-7A-28A-40C | 40 |  |  | 25 | 50 | 75 | 100 | TDD |

Table 7.3.1A-0bE: Reference sensitivity for carrier aggregation QPSK PREFSENS, CA (exceptions due to cross band isolation issues of TDD and FDD bands)

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| EUTRA CA Configuration | EUTRA band | Channel bandwidth | | | | | | Duplex mode | Applicable active UL band |
| 1.4 MHz (dBm) | 3 MHz (dBm) | 5 MHz (dBm) | 10 MHz (dBm) | 15 MHz (dBm) | 20 MHz (dBm) |
| CA\_3A-7A-28A-40A  CA\_3A-7A-28A-40C | 319 |  |  | -94.2 | -91.2 | -89.5 | -88.3 | FDD | 40 |
| 719 |  |  | -96.8 | -94 | -92.4 | -91.2 | FDD |
| 28 |  |  | -96.8 | -94.1 | -92.5 | -89.8 | FDD |
| CA\_3A-7A-28A-40A  CA\_3A-7A-28A-40C | 4019 |  |  | -94.6 | -92.1 | -90.5 | -89.4 | TDD | 3 |
| CA\_3A-7A-28A-40A  CA\_3A-7A-28A-40C | 4019 |  |  | -96 | -93.3 | -91.7 | -90.6 | TDD | 7 |
| CA\_3A-7A-28A-40A  CA\_3A-7A-28A-40C | 4019 |  |  | -95.1 | -92.9 | -91.4 | -90.5 | TDD | 28 |
| NOTE 19: Applicable for the operations with 2 or 4 antenna ports supported in the band with carrier aggregation configured. | | | | | | | | | |

Table 7.3.1A-0bF: Uplink configuration for reference sensitivity (exceptions due to cross band isolation issues of TDD and FDD bands)

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| E-UTRA Band / Channel bandwidth of the affected DL band / NRB / Duplex mode | | | | | | | | |
| EUTRA CA Configuration | E-UTRA Band | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz | Duplex Mode |
| CA\_3A-7A-28A-40A  CA\_3A-7A-28A-40C | 3 |  |  | 25 | 50 | 501 | 501 | FDD |
| 7 |  |  | 25 | 50 | 75 | 751 | FDD |
| 28 |  |  | 25 | 251 | 251 | 251 | FDD |
| 40 |  |  | 25 | 50 | 75 | 100 | TDD |
| NOTE 1: 1 refers to the UL resource blocks shall be located as close as possible to the downlink operating band but confined within the transmission bandwidth configuration for the channel bandwidth (Table 5.6-1). | | | | | | | | |

## 5.12 CA\_1-3-28-40

### 5.12.1 Channel bandwidths per operating band for CA

Table 5.12.1-1: Supported E-UTRA bandwidths per CA configuration for 4DL inter-band CA

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| E-UTRA CA configuration / Bandwidth combination set | | | | | | | | | | |
| E-UTRA CA Configuration | Uplink CA configurations | E-UTRA Bands | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz | Maximum aggregated bandwidth  [MHz] | Bandwidth combination set |
| CA\_1A-3A-28A-40A | - | 1 |  |  | Yes | Yes | Yes | Yes | 80 | 0 |
| 3 |  |  | Yes | Yes | Yes | Yes |
| 28 |  |  | Yes | Yes | Yes | Yes |
| 40 |  |  | Yes | Yes | Yes | Yes |
| CA\_1A-3A-28A-40C | - | 1 |  |  | Yes | Yes | Yes | Yes | 100 | 0 |
| 3 |  |  | Yes | Yes | Yes | Yes |
| 28 |  |  | Yes | Yes | Yes | Yes |
| 40 | See CA\_40C Bandwidth combination set 0 in Table 5.6A.1-1 | | | | | |
|  | | | | | | | | | | |

### 5.12.2 ΔTIB,c and ΔRIB,c values

ΔRIB,c values for CA\_1-3-28-40 are derived from CA\_1-3-28 and CA 1-3-40. For the ΔTIB,c the (maximum) values from CA\_1-28-40, CA\_1-3-28 and CA\_1-3-40 are used. Values will be defined in the following tables in TS 36.101.

Table 5.12.2-1: ΔTIB,c (four bands)

|  |  |  |
| --- | --- | --- |
| E-UTRA operating band combination | E-UTRA Band | ΔTIB,c [dB] |
| CA\_1-3-28-40 | 1 | 0.5 |
| 3 | 0.5 |
| 28 | 0.6 |
| 40 | 0.5 |

Table 5.12.2-2: ΔRIB,c (four bands)

|  |  |  |
| --- | --- | --- |
| E-UTRA operating band combination | E-UTRA Band | ΔRIB,c [dB] |
| CA\_1-3-28-40 | 1 | 0 |
| 3 | 0 |
| 28 | 0.2 |
| 40 | 0 |

### 5.12.3 REFSENS requirements

The REFSENS requirements for CA\_1A-3A-28A-40A and CA\_1A-3A-28A-40C need to be added in TS 36.101 as in tables below:

Table 7.3.1A-0a: Reference sensitivity for carrier aggregation QPSK PREFSENS, CA (exceptions due to harmonic issue)

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Channel bandwidth | | | | | | | | |
| EUTRA CA Configuration | EUTRA band | 1.4 MHz (dBm) | 3 MHz (dBm) | 5 MHz (dBm) | 10 MHz (dBm) | 15 MHz (dBm) | 20 MHz (dBm) | Duplex mode |
| CA\_1A-3A-28A-40A15,16  CA\_1A-3A-28A-40C 15,16 | 28 |  |  | -60.7 | -60.7 | -60.7 | -60.7 | FDD |

Table 7.3.1A-0b: Uplink configuration for the low band (exceptions due to harmonic issue)

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| E-UTRA Band / Channel bandwidth of the high band / NRB / Duplex mode | | | | | | | | |
| EUTRA CA Configuration | UL band | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz | Duplex mode |
| CA\_1A-3A-28A-40A  CA\_1A-3A-28A-40C | 40 |  |  | 25 | 50 | 75 | 100 | TDD |

Table 7.3.1A-0bD1: Reference sensitivity for carrier aggregation QPSK PREFSENS, CA (exceptions for four bands due to close proximity of UL to DL channel)

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Channel bandwidth | | | | | | | | |
| EUTRA CA Configuration | EUTRA band | 1.4 MHz (dBm) | 3 MHz (dBm) | 5 MHz (dBm) | 10 MHz (dBm) | 15 MHz (dBm) | 20 MHz (dBm) | Duplex mode |
| CA\_1A-3A-28A-40A | 34,9 |  |  | -94 | -91.5 | -90 | -89 | FDD |
| 35 |  |  | -97 | -94 | -92.2 | -91 |
| 40 |  |  | [-93.4] | -91.9 | -90.4 | -89.4 | TDD |
| CA\_1A-3A-28A-40C | 34,9 |  |  | -94 | -91.5 | -90 | -89 | FDD |
| 35 |  |  | -97 | -94 | -92.2 | -91 |
| 40 |  |  | -92.6 | -90.5 | -89.2 | -88.1 | TDD |
| NOTE 4: These requirements apply when the uplink is active in Band 1 and the separation between the lower edge of the uplink channel in Band 1 and the upper edge of the downlink channel in Band 3 is < 60 MHz. For each channel bandwidth in the bands other than Band 1, the requirement applies regardless of channel bandwidth in Band 1.  NOTE 5: These requirements apply when the uplink is active in Band 1 and the separation between the lower edge of the uplink channel in Band 1 and the upper edge of the downlink channel in Band 3 is ≥ 60 MHz. For each channel bandwidth in the bands other than Band 1, the requirement applies regardless of channel bandwidth in Band 1.  NOTE 9: Applicable for the operations with 2 or 4 antenna ports supported in the band with carrier aggregation configured. | | | | | | | | |

Table 7.3.1A-0bD2: Uplink configuration for the low band (exceptions for four bands due to close proximity of UL to DL channel)

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| E-UTRA Band / Channel bandwidth of the affected DL band / NRB / Duplex mode | | | | | | | | |
| **EUTRA CA Configuration** | UL band | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz | Duplex mode |
| CA\_1A-3A-28A-40A  CA\_1A-3A-28A-40C | 11,2 |  |  | 25 | 25 | 25 | 25 | FDD |
| 11,3 |  |  | 25 | 45 | 45 | 45 |
| NOTE 1: refers to the UL resource blocks shall be located as close as possible to the downlink channel in Band 3 but confined within the transmission bandwidth configuration for the channel bandwidth (Table 5.6-1) in the uplink channel in Band 1.  NOTE 2: UL allocation when the separation between the lower edge of the uplink channel in Band 1 and the upper edge of the downlink channel in Band 3 is < 60 MHz  NOTE 3: UL allocation when the separation between the lower edge of the uplink channel in Band 1 and the upper edge of the downlink channel in Band 3 is ≥ 60 MHz. | | | | | | | | |

Table 7.3.1A-0bE: Reference sensitivity for carrier aggregation QPSK PREFSENS, CA (exceptions due to cross band isolation issues of TDD and FDD bands)

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| EUTRA CA Configuration | EUTRA band | Channel bandwidth | | | | | | Duplex mode | Applicable active UL band |
| 1.4 MHz (dBm) | 3 MHz (dBm) | 5 MHz (dBm) | 10 MHz (dBm) | 15 MHz (dBm) | 20 MHz (dBm) |
| CA\_1A-3A-28A-40A  CA\_1A-3A-28A-40C | 119 |  |  | -91.7 | [-89.5] | [-87.9] | [-86.9] | FDD | 40 |
| 319 |  |  | -94.2 | -91.2 | -89.5 | -88.3 | FDD |
| 28 |  |  | -96.8 | -94.1 | -92.5 | -89.8 | FDD |
| CA\_1A-3A-28A-40A  CA\_1A-3A-28A-40C | 4019 |  |  | [-93.4] | -91.9 | -90.4 | -89.4 | TDD | 1 |
| CA\_1A-3A-28A-40A  CA\_1A-3A-28A-40C | 4019 |  |  | -94.6 | -92.1 | -90.5 | -89.4 | TDD | 3 |
| CA\_1A-3A-28A-40A  CA\_1A-3A-28A-40C | 4019 |  |  | -95.1 | -92.9 | -91.4 | -90.5 | TDD | 28 |
| NOTE 19: Applicable for the operations with 2 or 4 antenna ports supported in the band with carrier aggregation configured. | | | | | | | | | |

Table 7.3.1A-0bF: Uplink configuration for reference sensitivity (exceptions due to cross band isolation issues of TDD and FDD bands)

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| E-UTRA Band / Channel bandwidth of the affected DL band / NRB / Duplex mode | | | | | | | | |
| EUTRA CA Configuration | E-UTRA Band | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz | Duplex Mode |
| CA\_1A-3A-28A-40A  CA\_1A-3A-28A-40C | 1 |  |  | 25 | 50 | 75 | 100 | FDD |
| 3 |  |  | 25 | 50 | 501 | 501 | FDD |
| 28 |  |  | 25 | 251 | 251 | 251 | FDD |
| 40 |  |  | 25 | 50 | 75 | 100 | TDD |
| NOTE 1: 1 refers to the UL resource blocks shall be located as close as possible to the downlink operating band but confined within the transmission bandwidth configuration for the channel bandwidth (Table 5.6-1). | | | | | | | | |

## 5.13 CA\_1-7-28-40

### 5.13.1 Channel bandwidths per operating band for CA

Table 5.13.1-1: Supported E-UTRA bandwidths per CA configuration for 4DL inter-band CA

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| E-UTRA CA configuration / Bandwidth combination set | | | | | | | | | | |
| E-UTRA CA Configuration | Uplink CA configurations | E-UTRA Bands | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz | Maximum aggregated bandwidth  [MHz] | Bandwidth combination set |
| CA\_1A-7A-28A-40A | - | 1 |  |  | Yes | Yes | Yes | Yes | 80 | 0 |
| 7 |  |  |  | Yes | Yes | Yes |
| 28 |  |  | Yes | Yes | Yes | Yes |
| 40 |  |  | Yes | Yes | Yes | Yes |
| CA\_1A-7A-28A-40C | - | 1 |  |  | Yes | Yes | Yes | Yes | 100 | 0 |
| 7 |  |  |  | Yes | Yes | Yes |
| 28 |  |  | Yes | Yes | Yes | Yes |
| 40 | See CA\_40C Bandwidth combination set 0 in Table 5.6A.1-1 | | | | | |
|  | | | | | | | | | | |

### 5.13.2 ΔTIB,c and ΔRIB,c values

ΔRIB,c values for CA\_1-7-28-40 are derived from CA\_1-7-40 and CA 1-7-28. For the ΔTIB,c the (maximum) values from CA\_1-7-28, CA\_1-7-40 and CA\_7-28-40 are used. Values will be defined in the following tables in TS 36.101.

Table 5.13.2-1: ΔTIB,c (four bands)

|  |  |  |
| --- | --- | --- |
| E-UTRA operating band combination | E-UTRA Band | ΔTIB,c [dB] |
| CA\_1-7-28-40 | 1 | 0.6 |
| 7 | 0.8 |
| 28 | 0.6 |
| 40 | 0.9 |

Table 5.13.2-2: ΔRIB,c (four bands)

|  |  |  |
| --- | --- | --- |
| E-UTRA operating band combination | E-UTRA Band | ΔRIB,c [dB] |
| CA\_1-7-28-40 | 1 | 0 |
| 7 | 0.3 |
| 28 | 0.2 |
| 40 | 0.8 |

### 5.13.3 REFSENS requirements

The REFSENS requirements for CA\_1A-7A-28A-40A and CA\_1A-7A-28A-40C need to be added in TS 36.101 as in tables below:

Table 7.3.1A-0a: Reference sensitivity for carrier aggregation QPSK PREFSENS, CA (exceptions due to harmonic issue)

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Channel bandwidth | | | | | | | | |
| EUTRA CA Configuration | EUTRA band | 1.4 MHz (dBm) | 3 MHz (dBm) | 5 MHz (dBm) | 10 MHz (dBm) | 15 MHz (dBm) | 20 MHz (dBm) | Duplex mode |
| CA\_1A-7A-28A-40A15,16  CA\_1A-7A-28A-40C 15,16 | 28 |  |  | -60.7 | -60.7 | -60.7 | -60.7 | FDD |

Table 7.3.1A-0b: Uplink configuration for the low band (exceptions due to harmonic issue)

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| E-UTRA Band / Channel bandwidth of the high band / NRB / Duplex mode | | | | | | | | |
| EUTRA CA Configuration | UL band | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz | Duplex mode |
| CA\_1A-7A-28A-40A  CA\_1A-7A-28A-40C | 40 |  |  | 25 | 50 | 75 | 100 | TDD |

Table 7.3.1A-0bE: Reference sensitivity for carrier aggregation QPSK PREFSENS, CA (exceptions due to cross band isolation issues of TDD and FDD bands)

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| EUTRA CA Configuration | EUTRA band | Channel bandwidth | | | | | | Duplex mode | Applicable active UL band |
| 1.4 MHz (dBm) | 3 MHz (dBm) | 5 MHz (dBm) | 10 MHz (dBm) | 15 MHz (dBm) | 20 MHz (dBm) |
| CA\_1A-7A-28A-40A  CA\_1A-7A-28A-40C | 119 |  |  | -91.7 | -89.5 | -87.9 | -86.9 | FDD | 40 |
| 719 |  |  | -96.8 | -94 | -92.4 | -91.2 | FDD |
| 28 |  |  | -96.8 | -94.1 | -92.5 | -89.8 | FDD |
| CA\_1A-7A-28A-40A  CA\_1A-7A-28A-40C | 4019 |  |  | -92.6 | -90.5 | -89.2 | -88.1 | TDD | 1 |
| CA\_1A-7A-28A-40A  CA\_1A-7A-28A-40C | 4019 |  |  | -96 | -93.3 | -91.7 | -90.6 | TDD | 7 |
| CA\_1A-7A-28A-40A  CA\_1A-7A-28A-40C | 4019 |  |  | -95.1 | -92.9 | -91.4 | -90.5 | TDD | 28 |
| NOTE 19: Applicable for the operations with 2 or 4 antenna ports supported in the band with carrier aggregation configured. | | | | | | | | | |

Table 7.3.1A-0bF: Uplink configuration for reference sensitivity (exceptions due to cross band isolation issues of TDD and FDD bands)

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| E-UTRA Band / Channel bandwidth of the affected DL band / NRB / Duplex mode | | | | | | | | |
| EUTRA CA Configuration | E-UTRA Band | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz | Duplex Mode |
| CA\_1A-7A-28A-40A  CA\_1A-7A-28A-40C | 1 |  |  | 25 | 50 | 75 | 100 | FDD |
| 7 |  |  | 25 | 50 | 75 | 751 | FDD |
| 28 |  |  | 25 | 251 | 251 | 251 | FDD |
| 40 |  |  | 25 | 50 | 75 | 100 | TDD |
| NOTE 1: 1 refers to the UL resource blocks shall be located as close as possible to the downlink operating band but confined within the transmission bandwidth configuration for the channel bandwidth (Table 5.6-1). | | | | | | | | |

## 5.14 CA\_3-5-7-28 and CA\_3-3-5-7-28

### 5.14.1 Channel bandwidths per operating band for CA

Table 5.5A-2b: Inter-band CA operating bands (four bands)

|  |  |
| --- | --- |
| E-UTRA CA Band | E-UTRA Band  (Table 5.5.1) |
| CA\_3-5-7-28 | 3, 5, 7, 28 |
| CA\_3-3-5-7-28 | 3, 5, 7, 28 |
| NOTE: The frequency range in band 28 is restricted for this CA band combination to 718-748 MHz for the UL and 773-803 MHz for the DL | |

Table 5.14.1-1: Supported E-UTRA bandwidths per CA configuration for 4DL inter-band CA

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| E-UTRA CA configuration / Bandwidth combination set | | | | | | | | | | |
| E-UTRA CA Configuration | Uplink CA configurations | E-UTRA Bands | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz | Maximum aggregated bandwidth  [MHz] | Bandwidth combination set |
| CA\_3A-5A-7A-28A | - | 3 |  |  | Yes | Yes | Yes | Yes | 70 | 0 |
| 5 |  |  | Yes | Yes |  |  |
| 7 |  |  | Yes | Yes | Yes | Yes |
| 28 |  |  | Yes | Yes | Yes | Yes |
| CA\_3A-5A-7C-28A | - | 3 |  |  | Yes | Yes | Yes | Yes | 90 | 0 |
| 5 |  |  | Yes | Yes |  |  |
| 7 | See CA\_7C Bandwidth Combination Set 1 in Table 5.6A.1-1 | | | | | |
| 28 |  |  | Yes | Yes | Yes | Yes |
| CA\_3A-3A-5A-7A-28A | - | 3 | See CA\_3A-3A Bandwidth Combination Set 0 in Table 5.6A.1-3 | | | | | | 90 | 0 |
| 5 |  |  | Yes | Yes |  |  |
| 7 |  |  |  | Yes | Yes | Yes |
| 28 |  |  | Yes | Yes | Yes | Yes |

### 5.14.2 ΔTIB,c and ΔRIB,c values

ΔRIB,c values for CA\_3-5-7-28 are derived from CA\_3-5-7, CA\_3-5-28, CA\_3-7-28 and CA\_5-7-28.

Table 5.14.2-1: ΔTIB,c (four bands)

|  |  |  |
| --- | --- | --- |
| E-UTRA operating band combination | E-UTRA Band | ΔTIB,c [dB] |
| CA\_3-5-7-28  CA\_3-3-5-7-28 | 3 | 0.5 |
| 5 | 0.5 |
| 7 | 0.5 |
| 28 | 0.5 |

Table 5.14.2-2: ΔRIB,c (four bands)

|  |  |  |
| --- | --- | --- |
| E-UTRA operating band combination | E-UTRA Band | ΔRIB,c [dB] |
| CA\_3-5-7-28  CA\_3-3-5-7-28 | 3 | 0 |
| 5 | 0.1 |
| 7 | 0 |
| 28 | 0.1 |

### 5.14.3 REFSENS requirements

REFSENS exceptions are not needed for CA\_3-5-7-28 or CA\_3-3-5-7-28.

## 5.15 CA\_1-3-5-7 and CA\_1-3-3-5-7

### 5.15.1 Channel bandwidths per operating band for CA

Table 5.15.1-1: Supported E-UTRA bandwidths per CA configuration for 4DL inter-band CA

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| E-UTRA CA configuration / Bandwidth combination set | | | | | | | | | | |
| E-UTRA CA Configuration | Uplink CA configurations | E-UTRA Bands | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz | Maximum aggregated bandwidth  [MHz] | Bandwidth combination set |
| CA\_1A-3A-5A-7A | - | 1 |  |  | Yes | Yes | Yes | Yes | 70 | 1 |
| 3 |  |  | Yes | Yes | Yes | Yes |
| 5 |  |  | Yes | Yes |  |  |
| 7 |  |  |  | Yes | Yes | Yes |
| CA\_1A-3A-3A-5A-7A | - | 1 |  |  | Yes | Yes | Yes |  | 85 | 0 |
| 3 | See CA\_3A-3A Bandwidth Combination Set 0 in Table 5.6A.1-3 | | | | | |
| 5 |  |  | Yes | Yes |  |  |
| 7 |  |  |  | Yes | Yes | Yes |

### 5.15.2 ΔTIB,c and ΔRIB,c values

ΔRIB,c values for CA\_1-3-3-5-7 are derived from CA\_1-3-5-7.

Table 5.15.2-1: ΔTIB,c (four bands)

|  |  |  |
| --- | --- | --- |
| E-UTRA operating band combination | E-UTRA Band | ΔTIB,c [dB] |
| CA\_1-3-3-5-7 | 1 | 0.6 |
| 3 | 0.6 |
| 5 | 0.3 |
| 7 | 0.6 |

Table 5.15.2-2: ΔRIB,c (four bands)

|  |  |  |
| --- | --- | --- |
| E-UTRA operating band combination | E-UTRA Band | ΔRIB,c [dB] |
| CA\_1-3-3-5-7 | 1 | 0 |
| 3 | 0 |
| 5 | 0 |
| 7 | 0 |

### 5.15.3 REFSENS requirements

Table 7.3.1A-0bD1: Reference sensitivity for carrier aggregation QPSK PREFSENS, CA (exceptions for four bands due to close proximity of UL to DL channel)

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Channel bandwidth | | | | | | | | |
| EUTRA CA Configuration | EUTRA band | 1.4 MHz (dBm) | 3 MHz (dBm) | 5 MHz (dBm) | 10 MHz (dBm) | 15 MHz (dBm) | 20 MHz (dBm) | Duplex mode |
| CA\_1A-3A-5A-7A  CA\_1A-3A-3A-5A-7A | 34,9 |  |  | -94 | -91.5 | -90 | -89 | FDD |
| 35 |  |  | -97 | -94 | -92.2 | -91 |
| NOTE 4: These requirements apply when the uplink is active in Band 1 and the separation between the lower edge of the uplink channel in Band 1 and the upper edge of the downlink channel in Band 3 is < 60 MHz. For each channel bandwidth in the bands other than Band 1, the requirement applies regardless of channel bandwidth in Band 1.  NOTE 5: These requirements apply when the uplink is active in Band 1 and the separation between the lower edge of the uplink channel in Band 1 and the upper edge of the downlink channel in Band 3 is ≥ 60 MHz. For each channel bandwidth in the bands other than Band 1, the requirement applies regardless of channel bandwidth in Band 1.  NOTE 9: Applicable for the operations with 2 or 4 antenna ports supported in the band with carrier aggregation configured. | | | | | | | | |

Table 7.3.1A-0bD2: Uplink configuration for the low band (exceptions for four bands due to close proximity of UL to DL channel)

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| E-UTRA Band / Channel bandwidth of the affected DL band / NRB / Duplex mode | | | | | | | | |
| **EUTRA CA Configuration** | UL band | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz | Duplex mode |
| CA\_1A-3A-5A-7A  CA\_1A-3A-3A-5A-7A | 11,2 |  |  | 25 | 25 | 25 | 25 | FDD |
| 11,3 |  |  | 25 | 45 | 45 | 45 |
| NOTE 1: refers to the UL resource blocks shall be located as close as possible to the downlink channel in Band 3 but confined within the transmission bandwidth configuration for the channel bandwidth (Table 5.6-1) in the uplink channel in Band 1.  NOTE 2: UL allocation when the separation between the lower edge of the uplink channel in Band 1 and the upper edge of the downlink channel in Band 3 is < 60 MHz  NOTE 3: UL allocation when the separation between the lower edge of the uplink channel in Band 1 and the upper edge of the downlink channel in Band 3 is ≥ 60 MHz. | | | | | | | | |

## 5.16 for CA\_1-3-5-28

### 5.16.1 Channel bandwidths per operating band for CA

Table 5.5A-2b: Inter-band CA operating bands (four bands)

|  |  |
| --- | --- |
| E-UTRA CA Band | E-UTRA Band  (Table 5.5.1) |
| CA\_1-3-5-28 | 1, 3, 5, 28 |
| NOTE: The frequency range in band 28 is restricted for this CA band combination to 718-748 MHz for the UL and 773-803 MHz for the DL | |

Table 5.16.1-1: Supported E-UTRA bandwidths per CA configuration for 4DL inter-band CA

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| E-UTRA CA configuration / Bandwidth combination set | | | | | | | | | | |
| E-UTRA CA Configuration | Uplink CA configurations | E-UTRA Bands | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz | Maximum aggregated bandwidth  [MHz] | Bandwidth combination set |
| CA\_1A-3A-5A-28A | - | 1 |  |  | Yes | Yes | Yes |  | 65 | 0 |
| 3 |  |  | Yes | Yes | Yes | Yes |
| 5 |  |  | Yes | Yes |  |  |
| 28 |  |  | Yes | Yes | Yes | Yes |

### 5.16.2 ΔTIB,c and ΔRIB,c values

ΔRIB,c values for CA\_1-3-5-28 are derived from CA\_1-3-5, CA\_1-3-28 and CA\_3-5-28.

Table 5.16.2-1: ΔTIB,c (four bands)

|  |  |  |
| --- | --- | --- |
| E-UTRA operating band combination | E-UTRA Band | ΔTIB,c [dB] |
| CA\_1-3-5-28 | 1 | 0.3 |
| 3 | 0.3 |
| 5 | 0.5 |
| 28 | 0.6 |

Table 5.16.2-2: ΔRIB,c (four bands)

|  |  |  |
| --- | --- | --- |
| E-UTRA operating band combination | E-UTRA Band | ΔRIB,c [dB] |
| CA\_1-3-5-28 | 1 | 0 |
| 3 | 0 |
| 5 | 0.1 |
| 28 | 0.2 |

### 5.16.3 REFSENS requirements

Table 7.3.1A-0bD1: Reference sensitivity for carrier aggregation QPSK PREFSENS, CA (exceptions for four bands due to close proximity of UL to DL channel)

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Channel bandwidth | | | | | | | | |
| EUTRA CA Configuration | EUTRA band | 1.4 MHz (dBm) | 3 MHz (dBm) | 5 MHz (dBm) | 10 MHz (dBm) | 15 MHz (dBm) | 20 MHz (dBm) | Duplex mode |
| CA\_1A-3A-5A-28A | 34,9 |  |  |  | -91.5 | -90 | -89 | FDD |
| 35 |  |  |  | -94 | -92.2 | -91 |
| NOTE 4: These requirements apply when the uplink is active in Band 1 and the separation between the lower edge of the uplink channel in Band 1 and the upper edge of the downlink channel in Band 3 is < 60 MHz. For each channel bandwidth in the bands other than Band 1, the requirement applies regardless of channel bandwidth in Band 1.  NOTE 5: These requirements apply when the uplink is active in Band 1 and the separation between the lower edge of the uplink channel in Band 1 and the upper edge of the downlink channel in Band 3 is ≥ 60 MHz. For each channel bandwidth in the bands other than Band 1, the requirement applies regardless of channel bandwidth in Band 1.  NOTE 9: Applicable for the operations with 2 or 4 antenna ports supported in the band with carrier aggregation configured. | | | | | | | | |

Table 7.3.1A-0bD2: Uplink configuration for the low band (exceptions for four bands due to close proximity of UL to DL channel)

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| E-UTRA Band / Channel bandwidth of the affected DL band / NRB / Duplex mode | | | | | | | | |
| **EUTRA CA Configuration** | UL band | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz | Duplex mode |
| CA\_1A-3A-5A-28A | 11,2 |  |  | 25 | 25 | 25 | 25 | FDD |
| 11,3 |  |  | 25 | 45 | 45 | 45 |
| NOTE 1: refers to the UL resource blocks shall be located as close as possible to the downlink channel in Band 3 but confined within the transmission bandwidth configuration for the channel bandwidth (Table 5.6-1) in the uplink channel in Band 1.  NOTE 2: UL allocation when the separation between the lower edge of the uplink channel in Band 1 and the upper edge of the downlink channel in Band 3 is < 60 MHz  NOTE 3: UL allocation when the separation between the lower edge of the uplink channel in Band 1 and the upper edge of the downlink channel in Band 3 is ≥ 60 MHz. | | | | | | | | |

Table 7.3.1A-0a: Reference sensitivity for carrier aggregation QPSK PREFSENS, CA (exceptions due to harmonic issue)

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Channel bandwidth | | | | | | | | |
| EUTRA CA Configuration | EUTRA band | 1.4 MHz (dBm) | 3 MHz (dBm) | 5 MHz (dBm) | 10 MHz (dBm) | 15 MHz (dBm) | 20 MHz (dBm) | Duplex mode |
| CA\_1A-3A-5A-28A 5,6 | 133 |  |  | -89.8 | -89.4 | -89 | -88.7 | FDD |
| NOTE 5: These requirements apply when there is at least one individual RE within the uplink transmission bandwidth of a low band for which the 3rd transmitter harmonic is within the downlink transmission bandwidth of a high band.  NOTE 6: The requirements should be verified for UL EARFCN of a low band (superscript LB) such that in MHz and  with the carrier frequency of a high band in MHz and the channel bandwidth configured in the low band. | | | | | | | | |

Table 7.3.1A-0b: Uplink configuration for the low band (exceptions due to harmonic issue)

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| E-UTRA Band / Channel bandwidth of the high band / NRB / Duplex mode | | | | | | | | |
| EUTRA CA Configuration | UL band | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz | Duplex mode |
| CA\_1A-3A-5A-28A | 28 |  |  | 8 | 16 | 25 | 25 | FDD |

## 5.17 for CA\_1-5-7-28

### 5.17.1 Channel bandwidths per operating band for CA

Table 5.5A-2b: Inter-band CA operating bands (four bands)

|  |  |
| --- | --- |
| E-UTRA CA Band | E-UTRA Band  (Table 5.5.1) |
| CA\_1-5-7-28 | 1, 5, 7, 28 |
| NOTE: The frequency range in band 28 is restricted for this CA band combination to 718-748 MHz for the UL and 773-803 MHz for the DL | |

Table 5.17.1-1: Supported E-UTRA bandwidths per CA configuration for 4DL inter-band CA

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| E-UTRA CA configuration / Bandwidth combination set | | | | | | | | | | |
| E-UTRA CA Configuration | Uplink CA configurations | E-UTRA Bands | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz | Maximum aggregated bandwidth  [MHz] | Bandwidth combination set |
| CA\_1A-3A-5A-7A-28A | - | 1 |  |  | Yes | Yes | Yes |  | 65 | 0 |
| 5 |  |  | Yes | Yes |  |  |
| 7 |  |  | Yes | Yes | Yes | Yes |
| 28 |  |  | Yes | Yes | Yes | Yes |

### 5.17.2 ΔTIB,c and ΔRIB,c values

ΔRIB,c values for CA\_1-5-7-28 are derived from CA\_1-7-28, CA\_1-5-7, CA\_1-7-28 and CA\_5-7-28.

Table 5.17.2-1: ΔTIB,c (four bands)

|  |  |  |
| --- | --- | --- |
| E-UTRA operating band combination | E-UTRA Band | ΔTIB,c [dB] |
| CA\_1-5-7-28 | 1 | 0.6 |
| 5 | 0.5 |
| 7 | 0.6 |
| 28 | 0.6 |

Table 5.17.2-2: ΔRIB,c (four bands)

|  |  |  |
| --- | --- | --- |
| E-UTRA operating band combination | E-UTRA Band | ΔRIB,c [dB] |
| CA\_1-5-7-28 | 1 | 0 |
| 5 | 0.1 |
| 7 | 0 |
| 28 | 0.2 |

### 5.17.3 REFSENS requirements

Table 7.3.1A-0a: Reference sensitivity for carrier aggregation QPSK PREFSENS, CA (exceptions due to harmonic issue)

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Channel bandwidth | | | | | | | | |
| EUTRA CA Configuration | EUTRA band | 1.4 MHz (dBm) | 3 MHz (dBm) | 5 MHz (dBm) | 10 MHz (dBm) | 15 MHz (dBm) | 20 MHz (dBm) | Duplex mode |
| CA\_1A-5A-7A-28A5,6 | 133 |  |  | -89.8 | -89.4 | -89 | -88.7 | FDD |
| NOTE 5: These requirements apply when there is at least one individual RE within the uplink transmission bandwidth of a low band for which the 3rd transmitter harmonic is within the downlink transmission bandwidth of a high band.  NOTE 6: The requirements should be verified for UL EARFCN of a low band (superscript LB) such that in MHz and  with the carrier frequency of a high band in MHz and the channel bandwidth configured in the low band. | | | | | | | | |

Table 7.3.1A-0b: Uplink configuration for the low band (exceptions due to harmonic issue)

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| E-UTRA Band / Channel bandwidth of the high band / NRB / Duplex mode | | | | | | | | |
| EUTRA CA Configuration | UL band | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz | Duplex mode |
| CA\_1A-5A-7A-28A | 28 |  |  | 8 | 16 | 25 | 25 | FDD |

## 5.18 CA\_2-7-29-66

### 5.18.1 Channel bandwidths per operating band for CA

Table 5.18.1-1: Supported E-UTRA bandwidths per CA configuration for 4DL inter-band CA

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| E-UTRA CA configuration / Bandwidth combination set | | | | | | | | | | |
| E-UTRA CA Configuration | Uplink CA configurations | E-UTRA Bands | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz | Maximum aggregated bandwidth  [MHz] | Bandwidth combination set |
| CA\_2A-7A-29A-66A | - | 2 |  |  | Yes | Yes | Yes | Yes | 70 | 0 |
| 7 |  |  |  | Yes | Yes | Yes |
| 29 |  |  | Yes | Yes |  |  |
| 66 |  |  | Yes | Yes | Yes | Yes |
| CA\_2A-7C-29A-66A | - | 2 |  |  | Yes | Yes | Yes | Yes | 90 | 0 |
| 7 | See CA\_7C Bandwidth combination set 1 in Table 5.6A.1-1 | | | | | |
| 29 |  |  | Yes | Yes |  |  |
| 66 |  |  | Yes | Yes | Yes | Yes |
| CA\_2A-7A-7A-29A-66A | - | 2 |  |  | Yes | Yes | Yes | Yes | 90 | 0 |
| 7 | See CA\_7A-7A Bandwidth combination set 3 in Table 5.6A.1-3 | | | | | |
| 29 |  |  | Yes | Yes |  |  |
| 66 |  |  | Yes | Yes | Yes | Yes |
|  | | | | | | | | | | |

### 5.18.2 ΔTIB,c and ΔRIB,c values

ΔRIB,c values for CA\_2-7-29-66 are derived from CA\_2-7-66 and CA 7-29-66. For the ΔTIB,c the (maximum) values from CA\_2-7-66 are used. Values will be defined in the following tables in TS 36.101.

Table 5.18.2-1: ΔTIB,c (four bands)

|  |  |  |
| --- | --- | --- |
| E-UTRA operating band combination | E-UTRA Band | ΔTIB,c [dB] |
| CA\_2-7-29-66, CA\_2-7-7-29-66 | 2 | 0.5 |
| 7 | 0.5 |
| 66 | 0.5 |

Table 5.18.2-2: ΔRIB,c (four bands)

|  |  |  |
| --- | --- | --- |
| E-UTRA operating band combination | E-UTRA Band | ΔRIB,c [dB] |
| CA\_2-7-29-66, CA\_2-7-7-29-66 | 2 | 0.3 |
| 7 | 0.5 |
| 66 | 0.5 |

### 5.18.3 REFSENS requirements

The REFSENS requirements for CA\_2A-7A-29A-66A, CA\_2A-7C-29A-66A and CA\_2A-7A-7A-29A-66A need to be added in TS 36.101 as in tables below:

Table 7.3.1A-0d: Reference sensitivity QPSK PREFSENS (CA with a SDL band)

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| EUTRA CA Configuration | EUTRA band | Channel bandwidth | | | | | | Duplex mode |
| 1.4 MHz (dBm) | 3 MHz (dBm) | 5 MHz (dBm) | 10 MHz (dBm) | 15 MHz (dBm) | 20 MHz (dBm) |
| CA\_2A-7A-29A-66A  CA\_2A-7C-29A-66A  CA\_2A-7A-7A-29A-66A | 2 |  |  | -97.7 | -94.7 | -92.9 | -91.7 | FDD |
| 7 |  |  |  | -94.5 | -92.7 | -91.5 |
| 29 |  |  | -97 | -94 |  |  |
| 66 |  |  | -99 | -96 | -94.2 | -93 |
|  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |

## 5.19 CA\_1-3-7-46 (CA\_1A-3A-7A-46A to CA\_1A-3A-7A-46E)

### 5.19.1 Channel bandwidths per operating band for CA

Table 5.19.1-1: Supported E-UTRA bandwidths per CA configuration for 4DL~7DL inter-band CA

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| CA operating / Channel bandwidth | | | | | | | | Maximum aggregated bandwidth  [MHz] | Bandwidth Combination Set |
| CA Configuration | E-UTRA Bands | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| CA\_1A-3A-7A-46A | 1 |  |  | Yes | Yes | Yes | Yes | 80 | 0 |
| 3 |  |  | Yes | Yes | Yes | Yes |
| 7 |  |  | Yes | Yes | Yes | Yes |
| 46 |  |  |  |  |  | Yes |
| CA\_1A-3A-7A-46C | 1 |  |  | Yes | Yes | Yes | Yes | 100 | 0 |
| 3 |  |  | Yes | Yes | Yes | Yes |
| 7 |  |  | Yes | Yes | Yes | Yes |
| 46 | See CA\_46C in Table 5.6A.1-1 of TS 36.101 Bandwidth Combination Set 0 | | | | | |
| CA\_1A-3A-7A-46D | 1 |  |  | Yes | Yes | Yes | Yes | 120 | 0 |
| 3 |  |  | Yes | Yes | Yes | Yes |
| 7 |  |  | Yes | Yes | Yes | Yes |
| 46 | See CA\_46D in Table 5.6A.1-1 of TS 36.101 Bandwidth Combination Set 0 | | | | | |
| CA\_1A-3A-7A-46E | 1 |  |  | Yes | Yes | Yes | Yes | 140 | 0 |
| 3 |  |  | Yes | Yes | Yes | Yes |
| 7 |  |  | Yes | Yes | Yes | Yes |
| 46 | See CA\_46E in Table 5.6A.1-1 of TS 36.101 Bandwidth Combination Set 0 | | | | | |

NOTE: For the UE that signals support of any bandwidth combination set for carrier aggregation, the UE shall support all single carrier bandwidths for the constituent bands as defined in Table 5.6.1-1 of TS 36.101 when operating in single carrier mode.

### 5.19.2 ∆TIB and ∆RIB values

For CA\_1-3-7-46, the ΔTIB,c and ΔRIB,c values are shown in table 5.19.2-1 and in table 5.19.2-2.

**Table 5.19.2-1: ΔTIB,c**

| **Inter-band CA Configuration** | **E-UTRA Band** | **ΔTIB,c [dB]** |
| --- | --- | --- |
| CA\_1-3-7-46 | 1 | 0.6 |
| 3 | 0.6 |
| 7 | 0.6 |

i

**Table 5.19.2-2: ΔRIB,c**

| **Inter-band CA Configuration** | **E-UTRA Band** | **ΔRIB,c [dB]** |
| --- | --- | --- |
| CA\_1-3-7-46 | 1 | 0 |
| 3 | 0 |
| 7 | 0 |
| 46 | 0 |

### 5.19.3 REFSENS requirements

For band combination CA\_1-3-7-46, the requirements are specified in Table 5.19.3-1 for the uplink in any band other than band 46.

Table 5.19.3-1: Reference sensitivity QPSK PREFSENS (CA with band 46)

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Channel bandwidth | | | | | | | | |
| EUTRA CA Configuration | EUTRA band | 1.4 MHz  (dBm) | 3 MHz  (dBm) | 5 MHz  (dBm) | 10 MHz  (dBm) | 15 MHz  (dBm) | 20 MHz  (dBm) | Duplex mode |
| CA\_1A-3A-7A-46A  CA\_1A-3A-7A-46C  CA\_1A-3A-7A-46D  CA\_1A-3A-7A-46E | 1 |  |  | -100 | -97 | -95.2 | -94 | FDD |
| 3 |  |  | -97 | -94 | -92.2 | -91 |
| 7 |  |  | -98 | -95 | -93.2 | -92 |
| 46 |  |  |  |  |  | -90 | TDD |

## 5.20 CA\_1-3-7-28

### 5.20.1 Channel bandwidths per operating band for CA

Table 5.20.1-1: Supported E-UTRA bandwidths per CA configuration for 4DL inter-band CA

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| E-UTRA CA configuration / Bandwidth combination set | | | | | | | | | | |
| E-UTRA CA Configuration | Uplink CA configurations | E-UTRA Bands | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz | Maximum aggregated bandwidth  [MHz] | Bandwidth combination set |
| CA\_1A-1A-3A-7A-28A | - | 1 | See CA\_1A-1A Bandwidth Combination Set 0 in Table 5.6A.1-3 | | | | | | 100 | 0 |
| 3 |  |  | Yes | Yes | Yes | Yes |
| 7 |  |  |  | Yes | Yes | Yes |
| 28 |  |  | Yes | Yes | Yes | Yes |
| CA\_1A-1A-3A-7C-28A | CA\_7C | 1 | See CA\_1A-1A Bandwidth Combination Set 0 in Table 5.6A.1-3 | | | | | | 120 | 0 |
| 3 |  |  | Yes | Yes | Yes | Yes |
| 7 | See CA\_7C Bandwidth combination set 2 in Table 5.6A.1-1 | | | | | |
| 28 |  |  | Yes | Yes | Yes | Yes |
| CA\_1A-1A-3C-7A-28A | CA\_3C | 1 | See CA\_1A-1A Bandwidth Combination Set 0 in Table 5.6A.1-3 | | | | | | 120 | 0 |
| 3 | See CA\_3C Bandwidth combination set 0 in Table 5.6A.1-1 | | | | | |
| 7 |  |  |  | Yes | Yes | Yes |
| 28 |  |  | Yes | Yes | Yes | Yes |
| CA\_1A-1A-3C-7C-28A | CA\_3C CA\_7C | 1 | See CA\_1A-1A Bandwidth Combination Set 0 in Table 5.6A.1-3 | | | | | | 140 | 0 |
| 3 | See CA\_3C Bandwidth combination set 0 in Table 5.6A.1-1 | | | | | |
| 7 | See CA\_7C Bandwidth combination set 2 in Table 5.6A.1-1 | | | | | |
| 28 |  |  | Yes | Yes | Yes | Yes |
|  |  |  |  |  |  |  |  |  |  |  |
|  |  | | | | | |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| CA\_1A-3A-3A-7C-28A | CA\_7C | 1 |  |  | Yes | Yes | Yes | Yes | 120 | 0 |
| 3 | See CA\_3A-3A Bandwidth Combination Set 0 in Table 5.6A.1-3 | | | | | |
| 7 | See CA\_7C Bandwidth combination set 2 in Table 5.6A.1-1 | | | | | |
| 28 |  |  | Yes | Yes | Yes | Yes |
| CA\_1A-1A-3A-3A-7A-28A | - | 1 | See CA\_1A-1A Bandwidth Combination Set 0 in Table 5.6A.1-3 | | | | | | 120 | 0 |
| 3 | See CA\_3A-3A Bandwidth Combination Set 0 in Table 5.6A.1-3 | | | | | |
| 7 |  |  |  | Yes | Yes | Yes |
| 28 |  |  | Yes | Yes | Yes | Yes |
| CA\_1A-1A-3A-3A-7C-28A | CA\_7C | 1 | See CA\_1A-1A Bandwidth Combination Set 0 in Table 5.6A.1-3 | | | | | | 140 | 0 |
| 3 | See CA\_3A-3A Bandwidth Combination Set 0 in Table 5.6A.1-3 | | | | | |
| 7 | See CA\_7C Bandwidth combination set 2 in Table 5.6A.1-1 | | | | | |
| 28 |  |  | Yes | Yes | Yes | Yes |

### 5.20.2 ΔTIB,c and ΔRIB,c values

The ΔTIB,c and ΔRIB,c values for three band CA\_1-3-7-28 are covered in TS 36.101 Table 6.2.5-4 (four bands) for ΔTIB,c and Table 7.3.1-1C (four bands) for ΔRIB,c.

### 5.20.3 REFSENS requirements

Reference sensitivity requirements follow those already specified for CA\_1A-3A-7A-28A in TS 36.101.

## 5.21 CA\_1-3-8-42

### 5.21.1 Channel bandwidths per operating band for CA

Table 5.21.1-1: Supported E-UTRA bandwidths per CA configuration for 3DL inter-band CA

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| E-UTRA CA configuration / Bandwidth combination set | | | | | | | | | | |
| E-UTRA CA Configuration | Uplink CA configurations | E-UTRA Bands | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz | Maximum aggregated bandwidth  [MHz] | Bandwidth combination set |
| CA\_1A-3A-8A-42A | - | 1 |  |  | Yes | Yes | Yes | Yes | 70 | 0 |
| 3 |  |  | Yes | Yes | Yes | Yes |
| 8 |  |  | Yes | Yes |  |  |
| 42 |  |  | Yes | Yes | Yes | Yes |
| CA\_1A-3A-8A-42C | - | 1 |  |  | Yes | Yes | Yes | Yes | 90 | 0 |
| 3 |  |  | Yes | Yes | Yes | Yes |
| 8 |  |  | Yes | Yes |  |  |
| 42 | See CA\_42C Bandwidth Combination Set 0 in Table 5.6A.1-1 | | | | | |

### 5.21.2 ∆TIB and ∆RIB values

For CA\_1-3-8-42, the ΔTIB,c and ΔRIB,c values are given in the tables below.

Table 5.21.2-1: ΔTIB,c

| Inter-band CA Configuration | E-UTRA Band | ΔTIB,c [dB] |
| --- | --- | --- |
| CA\_1-3-8-42 | 1 | 0.6 |
| 3 | 0.6 |
| 8 | 0.6 |
| 42 | 0.8 |

Table.5.21.2-2: ΔRIB

| Inter-band CA Configuration | E-UTRA Band | ΔRIB [dB] |
| --- | --- | --- |
| CA\_1-3-8-42 | 1 | 0.2 |
| 3 | 0.2 |
| 8 | 0.2 |
| 42 | 0.5 |

### 5.21.3 REFSENS requirements

REFSENS requirements for CA\_1-3-8-42 (exceptions due to harmonic issues) are defined in table 5.21.3-1 for inclusion in TS 36.101 table 7.3.1A-0a, and in table 5.21.3-2 for inclusion in TS 36.101 table 7.3.1A-0b.

Table 5.21.3-1: Reference sensitivity for carrier aggregation QPSK PREFSENS, CA (exceptions due to harmonic issue)

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Channel bandwidth | | | | | | | | |
| EUTRA CA Configuration | EUTRA band | 1.4 MHz (dBm) | 3 MHz (dBm) | 5 MHz (dBm) | 10 MHz (dBm) | 15 MHz (dBm) | 20 MHz (dBm) | Duplex mode |
| CA\_1A-3A-8A-42A4  CA\_1A-3A-8A-42C4 | 3 |  |  | N/A | N/A | N/A | N/A | FDD |
| CA\_1A-3A-8A-42A9,10  CA\_1A-3A-8A-42C9,10 | 4233 |  |  | -71.7 | -71.7 | -71.7 | -71.7 | TDD |
| CA\_1A-3A-8A-42A11  CA\_1A-3A-8A-42C11 | 4233 |  |  | -97.1 | -94.7 | -93.2 | -92.5 | TDD |
| CA\_1A-3A-8A-42A12,13  CA\_1A-3A-8A-42C12,13 | 4233 |  |  | -84.8 | -84.7 | -84.6 | -84.5 | TDD |
| NOTE 4: No requirements apply when there is at least one individual RE within the uplink transmission bandwidth of the low band for which the 2nd transmitter harmonic is within the downlink transmission bandwidth of the high band. The reference sensitivity for all active downlink component carriers is only verified when this is not the case (the requirements specified in clause 7.3.1 apply unless otherwise specified).  NOTE 9: These requirements apply when there is at least one individual RE within the uplink transmission bandwidth of the aggressor (lower) band for which the 2nd transmitter harmonic is within the downlink transmission bandwidth of a victim (higher) band and a range FHD above and below the edge of this downlink transmission bandwidth. The value FHD depends on the E-UTRA configuration: FHD = 10 MHz for CA\_3A-42A, CA\_3A-3A-42A, CA\_3A-42A-42A, CA\_1A-3A-20A-32A-42A, CA\_3A-42A-43A, CA\_3A-32A-42A-43A, CA\_1A-3A-42A, CA\_2A-13A-48A-66A, CA\_2A-48A, CA\_2A-48C, CA\_2A-48D, CA\_48A-66A, CA\_3A-7A-42A, CA\_3A-19A-42A, CA\_3A-20A-42A, CA\_3A-28A-42A, CA\_1A-3A-7A-42A, CA\_5A-48A-66A, CA\_5A-48A-66A-66A, CA\_13A-48A-66A, CA\_13A-48A-66A-66A, CA\_13A-48A-66B, CA\_13A-48A-66C, CA\_13A-48A-48A-66A, CA\_13A-48C-66A, CA\_13A-48D-66A, CA\_13A-48A-48C-66A, CA\_28A-32A, CA\_48A-66A-66A, CA\_48A-66B , CA\_48A-66C, CA\_48A-48A-66A, CA\_48C-66A, CA\_48A-48A-66A-66A, CA\_48A-48A-66B, CA\_48A-48A-66C, CA\_48C-66B, CA\_48C-66C, CA\_48E-66A, CA\_1A-3A-18A-42A, CA\_1A-3A-19A-42A, CA\_1A-3A-32A-42A, CA\_1A-3A-41A-42A, CA\_3A-7A-20A-42A, CA\_3A-20A-32A-42A, CA\_3A-28A-41A-42A, CA\_3A-18A-42A, CA\_3A-18A-42C, CA\_3A-8A-42A, CA\_3A-8A-42C, CA\_1A-3A-8A-42A and CA\_1A-3A-8A-42C. FHD = 0MHz for CA\_11A-28A, CA\_1A-11A-28A and CA\_3A-11A-28A.  NOTE 10: The requirements should be verified for UL EARFCN of the aggressor (lower) band (superscript LB) such that in MHz and  with carrier frequency in the victim (higher) band in MHz and the channel bandwidth configured in the lower band.  NOTE 11: The requirements are only applicable to channel bandwidths with a carrier frequency at  MHz offset from  in the victim (higher band) with , whereandare the channel bandwidths configured in the aggressor (lower) and victim (higher) bands in MHz, respectively.  NOTE 12: These requirements apply when there is at least one individual RE within the uplink transmission bandwidth of a low band for which the 4th transmitter harmonic is within the downlink transmission bandwidth of a high band.  NOTE 13: The requirements should be verified for UL EARFCN of a low band (superscript LB) such that in MHz and  with the carrier frequency of a high band in MHz and the channel bandwidth configured in the low band.  NOTE 33: Applicable for the operations with 2 or 4 antenna ports supported in the band with carrier aggregation configured. | | | | | | | | |

Table 5.21.3-2: Uplink configuration for the low band (exceptions due to harmonic issue)

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| E-UTRA Band / Channel bandwidth of the high band / NRB / Duplex mode | | | | | | | | |
| EUTRA CA Configuration | UL band | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz | Duplex mode |
| CA\_1A-3A-8A-42A  CA\_1A-3A-8A-42C | 3 |  |  | 12 | 25 | 36 | 50 | FDD |
| CA\_1A-3A-8A-42A  CA\_1A-3A-8A-42C | 8 |  |  | 8 | 16 | 25 | 25 | FDD |

REFSENS requirements for CA\_1-3-8-42 (exceptions due to close proximity) are defined in table 5.21.3-3 for inclusion in TS 36.101 table 7.3.1A-0bA, and in table 5.21.3-4 for inclusion in TS 36.101 table 7.3.1A-0bB.

Table 5.21.3-3: Reference sensitivity for carrier aggregation QPSK PREFSENS, CA (exceptions for two bands due to close proximity of UL to DL channel)

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Channel bandwidth | | | | | | | | |
| EUTRA CA Configuration | EUTRA band | 1.4 MHz (dBm) | 3 MHz (dBm) | 5 MHz (dBm) | 10 MHz (dBm) | 15 MHz (dBm) | 20 MHz (dBm) | Duplex mode |
| CA\_1A-3A-8A-42A4 | 39 |  |  | -94 | -91.5 | -90 | -89 | FDD |
| CA\_1A-3A-8A-42A5 | 3 |  |  | -97 | -94 | -92.2 | -91 | FDD |
| CA\_1A-3A-8A-42C4 | 39 |  |  | -94 | -91.5 | -90 | -89 | FDD |
| CA\_1A-3A-8A-42C5 | 3 |  |  | -97 | -94 | -92.2 | -91 | FDD |
| NOTE 4: These requirements apply when the uplink is active in Band 1 and the separation between the lower edge of the uplink channel in Band 1 and the upper edge of the downlink channel in Band 3 is < 60 MHz. For each channel bandwidth in Band 3, the requirement applies regardless of channel bandwidth in Band 1.  NOTE 5: These requirements apply when the uplink is active in Band 1 and the separation between the lower edge of the uplink channel in Band 1 and the upper edge of the downlink channel in Band 3 is ≥ 60 MHz. For each channel bandwidth in Band 3, the requirement applies regardless of channel bandwidth in Band 1.  NOTE 9: Applicable for the operations with 2 or 4 antenna ports supported in the band with carrier aggregation configured. | | | | | | | | |

Table 5.21.3-4: Uplink configuration for the uplink band (exceptions for two bands due to close proximity of UL to DL channel)

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| E-UTRA Band / Channel bandwidth of the affected DL band / NRB / Duplex mode | | | | | | | | |
| EUTRA CA Configuration | UL band | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz | Duplex mode |
| CA\_1A-3A-8A-42A1, 2 | 1 |  |  | 25 | 25 | 25 | 25 | FDD |
| CA\_1A-3A-8A-42A1, 3 | 1 |  |  | 25 | 45 | 45 | 45 | FDD |
| CA\_1A-3A-8A-42C1, 2 | 1 |  |  | 25 | 25 | 25 | 25 | FDD | |
| CA\_1A-3A-8A-42C1, 3 | 1 |  |  | 25 | 45 | 45 | 45 | FDD | |
| NOTE 1: refers to the UL resource blocks shall be located as close as possible to the downlink channel in Band 3 but confined within the transmission bandwidth configuration for the channel bandwidth (Table 5.6-1) in the uplink channel in Band 1.  NOTE 2: UL allocation when the separation between the lower edge of the uplink channel in Band 1 and the upper edge of the downlink channel in Band 3 is < 60 MHz  NOTE 3: UL allocation when the separation between the lower edge of the uplink channel in Band 1 and the upper edge of the downlink channel in Band 3 is ≥ 60 MHz. | | | | | | | | |

## 5.22 CA\_2-7-13-66

### 5.22.1 Channel bandwidths per operating band for CA

Table 5.22.1-1: Supported E-UTRA bandwidths per CA configuration for 4DL inter-band CA

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| E-UTRA CA configuration / Bandwidth combination set | | | | | | | | | | |
| E-UTRA CA Configuration | Uplink CA configurations | E-UTRA Bands | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz | Maximum aggregated bandwidth  [MHz] | Bandwidth combination set |
| CA\_2A-7A-13A-66A | - | 2 |  |  | Yes | Yes | Yes | Yes | 70 | 0 |
| 7 |  |  | Yes | Yes | Yes | Yes |
| 13 |  |  | Yes | Yes |  |  |
| 66 |  |  | Yes | Yes | Yes | Yes |
| CA\_2A-7C-13A-66A | - | 2 |  |  | Yes | Yes | Yes | Yes | 90 | 0 |
| 7 | See CA\_7C Bandwidth combination set 1 in Table 5.6A.1-1 | | | | | |
| 13 |  |  | Yes | Yes |  |  |
| 66 |  |  | Yes | Yes | Yes | Yes |
|  | | | | | | | | | | |

### 5.22.2 ΔTIB,c and ΔRIB,c values

ΔRIB,c values for CA\_2-7-13-66 are derived from CA\_2-7-66 and CA\_7-13-66. For the ΔTIB,c the values which derived from CA\_2-7-66 and CA\_7-13-66 are reused. Values will be defined in the following tables in TS 36.101.

Table 5.22.2-1: ΔTIB,c (three bands)

|  |  |  |
| --- | --- | --- |
| E-UTRA operating band combination | E-UTRA Band | ΔTIB,c [dB] |
| CA\_2-7-13-66 | 2 | 0.5 |
| 7 | 0.5 |
| 13 | 0.3 |
| 66 | 0.5 |

Table 5.22.2-2: ΔRIB,c (three bands)

|  |  |  |
| --- | --- | --- |
| E-UTRA operating band combination | E-UTRA Band | ΔRIB,c [dB] |
| CA\_2-7-13-66 | 2 | 0.3 |
| 7 | 0.5 |
| 13 | 0 |
| 66 | 0.5 |

### 5.22.3 REFSENS requirements

There are no reference sensitivity requirements needed.

## 5.23 CA\_1-3-7-7-20

### 5.23.1 Channel bandwidths per operating band for CA

Table 5.23.1-1: Supported E-UTRA bandwidths per CA configuration for 4-band DL inter-band CA

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| CA operating / Channel bandwidth | | | | | | | | | |
| CA Configuration | E-UTRA Bands | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz | **Maximum aggregated bandwidth**  [MHz] | Bandwidth Combination Set |
| CA\_1A-3A-7A-7A-20A | 1 |  |  | Yes | Yes | Yes | Yes | 100 | 0 |
| 3 |  |  | Yes | Yes | Yes | Yes |
| 7 | See CA\_7A-7A Bandwidth Combination Set 3 in Table 5.6A.1-3 | | | | | |
| 20 |  |  | Yes | Yes | Yes | Yes |

### 5.23.2 ∆TIB and ∆RIB values

The ∆TIB and ∆RIB values of CA\_1-3-7-7-20 is proposed to be the same as CA\_1-3-7-20 already specified in TS 36.101.

Table 5.23.2-1: ΔTIB,c for 4DL aggregation

| **Inter-band CA Configuration** | **E-UTRA Band** | **ΔTIB,c [dB]** |
| --- | --- | --- |
| CA\_1-3-7-7-20 | 1 | 0.6 |
| 3 | 0.6 |
| 7 | 0.6 |
| 20 | 0.3 |

Table 5.23.2-2: ΔRIB,c for 4DL aggregation

| **Inter-band CA Configuration** | **E-UTRA Band** | **ΔRIB,c [dB]** |
| --- | --- | --- |
| CA\_1-3-7-7-20 | 1 | 0 |
| 3 | 0 |
| 7 | 0 |
| 20 | 0 |

### 5.23.3 REFSENS requirements

REFSENS requirements of CA\_1A-3A-7A-20A defined in TS 36.101 can be applied for CA\_1A-3A-7A-7A-20A.

Table 7.3.1A-0bD1 and Table 7.3.1A-0bD2 in TS 36.101 shall include the REFSENS and uplink configurations according to the following tables.

Table 5.23.3-1: Reference sensitivity for carrier aggregation QPSK PREFSENS, CA (exceptions for four bands due to close proximity of UL to DL channel)

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Channel bandwidth | | | | | | | | |
| EUTRA CA Configuration | EUTRA band | 1.4 MHz (dBm) | 3 MHz (dBm) | 5 MHz (dBm) | 10 MHz (dBm) | 15 MHz (dBm) | 20 MHz (dBm) | Duplex mode |
| CA\_1A-3A-7A-7A-20A | 34,9 |  |  | -94 | -91.5 | -90 | -89 | FDD |
| 35 |  |  | -97 | -94 | -92.2 | -91 |
| NOTE 4: These requirements apply when the uplink is active in Band 1 and the separation between the lower edge of the uplink channel in Band 1 and the upper edge of the downlink channel in Band 3 is < 60 MHz. For each channel bandwidth in the bands other than Band 1, the requirement applies regardless of channel bandwidth in Band 1.  NOTE 5: These requirements apply when the uplink is active in Band 1 and the separation between the lower edge of the uplink channel in Band 1 and the upper edge of the downlink channel in Band 3 is ≥ 60 MHz. For each channel bandwidth in the bands other than Band 1, the requirement applies regardless of channel bandwidth in Band 1.  NOTE 9: Applicable for the operations with 2 or 4 antenna ports supported in the band with carrier aggregation configured. | | | | | | | | |

Table 5.23.3-2: Uplink configuration for the low band (exceptions for four bands due to close proximity of UL to DL channel)

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| E-UTRA Band / Channel bandwidth of the affected DL band / NRB / Duplex mode | | | | | | | | |
| **EUTRA CA Configuration** | UL band | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz | Duplex mode |
| CA\_1A-3A-7A-7A-20A | 11,2 |  |  | 25 | 25 | 25 | 25 | FDD |
| 11,3 |  |  | 25 | 45 | 45 | 45 |
| NOTE 1: refers to the UL resource blocks shall be located as close as possible to the downlink channel in Band 3 but confined within the transmission bandwidth configuration for the channel bandwidth (Table 5.6-1) in the uplink channel in Band 1.  NOTE 2: UL allocation when the separation between the lower edge of the uplink channel in Band 1 and the upper edge of the downlink channel in Band 3 is < 60 MHz  NOTE 3: UL allocation when the separation between the lower edge of the uplink channel in Band 1 and the upper edge of the downlink channel in Band 3 is ≥ 60 MHz. | | | | | | | | |

## 5.24 CA\_1-8-11-42

### 5.24.1 Channel bandwidths per operating band for CA

Table 5.24.1-1: Supported E-UTRA bandwidths per CA configuration for DL inter-band CA

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| E-UTRA CA configuration / Bandwidth combination set | | | | | | | | | | |
| E-UTRA CA Configuration | Uplink CA configurations | E-UTRA Bands | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz | Maximum aggregated bandwidth  [MHz] | Bandwidth combination set |
| CA\_1A-8A-11A-42A | - | 1 |  |  | Yes | Yes | Yes | Yes | 60 | 0 |
| 8 |  |  | Yes | Yes |  |  |
| 11 |  |  | Yes | Yes |  |  |
| 42 |  |  | Yes | Yes | Yes | Yes |
| CA\_1A-8A-11A-42C | - | 1 |  |  | Yes | Yes | Yes | Yes | 80 | 0 |
| 8 |  |  | Yes | Yes |  |  |
| 11 |  |  | Yes | Yes |  |  |
| 42 | See CA\_42C Bandwidth Combination Set 0 in Table 5.6A.1-1 | | | | | |

### 5.24.2 ∆TIB and ∆RIB values

For CA\_1-8-11-42, the ΔTIB,c and ΔRIB,c values are given in the tables below.

Table 5.24.2-1: ΔTIB,c

| Inter-band CA Configuration | E-UTRA Band | ΔTIB,c [dB] |
| --- | --- | --- |
| CA\_1-8-11-42 | 1 | 0.3 |
| 8 | 0.6 |
| 11 | 0.4 |
| 42 | 0.8 |

Table5.24.-2: ΔRIB

| Inter-band CA Configuration | E-UTRA Band | ΔRIB [dB] |
| --- | --- | --- |
| CA\_1-8-11-42 | 1 | 0 |
| 8 | 0.2 |
| 11 | 0 |
| 42 | 0.5 |

### 5.24.3 REFSENS requirements

REFSENS requirements for CA\_1-8-11-42 (exceptions due to harmonic issues) are defined in table 5.24.3-1 for inclusion in TS 36.101 table 7.3.1A-0a, and in table 5.24.3-2 for inclusion in TS 36.101 table 7.3.1A-0b.

Table 5.24.3-1: Reference sensitivity for carrier aggregation QPSK PREFSENS, CA (exceptions due to harmonic issue)

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Channel bandwidth | | | | | | | | |
| EUTRA CA Configuration | EUTRA band | 1.4 MHz (dBm) | 3 MHz (dBm) | 5 MHz (dBm) | 10 MHz (dBm) | 15 MHz (dBm) | 20 MHz (dBm) | Duplex mode |
| CA\_1A-8A-11A-42A12,13  CA\_1A-8A-11A-42C12,13 | 4233 |  |  | -84.8 | -84.7 | -84.6 | -84.5 | TDD |
| NOTE 12: These requirements apply when there is at least one individual RE within the uplink transmission bandwidth of a low band for which the 4th transmitter harmonic is within the downlink transmission bandwidth of a high band.  NOTE 13: The requirements should be verified for UL EARFCN of a low band (superscript LB) such that in MHz and  with the carrier frequency of a high band in MHz and the channel bandwidth configured in the low band.NOTE 33: Applicable for the operations with 2 or 4 antenna ports supported in the band with carrier aggregation configured. | | | | | | | | |

Table 5.24.3-2: Uplink configuration for the low band (exceptions due to harmonic issue)

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| E-UTRA Band / Channel bandwidth of the high band / NRB / Duplex mode | | | | | | | | |
| EUTRA CA Configuration | UL band | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz | Duplex mode |
| CA\_1A-8A-11A-42A  CA\_1A-8A-11A-42C | 8 |  |  | 8 | 16 | 25 | 25 | FDD |

## 5.25 CA\_2-7-26-66

### 5.25.1 Channel bandwidths per operating band for CA

Table 5.25.1-1: Supported E-UTRA bandwidths per CA configuration for 4-band DL inter-band CA

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| CA operating / Channel bandwidth | | | | | | | | | |
| CA Configuration | E-UTRA Bands | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz | **Maximum aggregated bandwidth**  [MHz] | Bandwidth Combination Set |
| CA\_2A-7A-26A-66A | 2 |  | Yes | Yes | Yes | Yes | Yes | 75 | 0 |
| 7 |  |  | Yes | Yes | Yes | Yes |
| 26 |  | Yes | Yes | Yes | Yes |  |
| 66 |  | Yes | Yes | Yes | Yes | Yes |

### 5.25.2 ∆TIB and ∆RIB values

The ∆TIB and ∆RIB values of CA\_2-7-26-66 is proposed to be based on CA\_2-7-66 in TS 36.101 for the high bands. The relaxation of the low band, i.e., band 26, is based on the diplexer insertion loss.

Table 5.25.2-1: ΔTIB,c for 4DL aggregation

| **Inter-band CA Configuration** | **E-UTRA Band** | **ΔTIB,c [dB]** |
| --- | --- | --- |
| CA\_2-7-26-66 | 2 | 0.5 |
| 7 | 0.5 |
| 26 | 0.3 |
| 66 | 0.5 |

Table 5.25.2-2: ΔRIB,c for 4DL aggregation

| **Inter-band CA Configuration** | **E-UTRA Band** | **ΔRIB,c [dB]** |
| --- | --- | --- |
| CA\_2-7-26-66 | 2 | 0.3 |
| 7 | 0.5 |
| 26 | 0 |
| 66 | 0.5 |

### 5.25.3 REFSENS requirements

There is no REFSENS exception for CA\_2A-7A-26A-66A.

# 6 5 Band Carrier Aggregation with Single UL: Specific Band Combination Part

## 6.1 CA\_1-3-7-20-32

### 6.1.1 Channel bandwidths per operating band for CA

Table 6.1.1-1: E-UTRA CA configurations and bandwidth combination sets defined for inter-band CA

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| CA operating / channel bandwidth | | | | | | | | Maximum aggregated bandwidth  [MHz] | Bandwidth Combination Set |
| E-UTRA CA Configuration | E-UTRA Bands | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| CA\_1A-3A-7A-20A-32A | 1 |  |  | Yes | Yes | Yes | Yes | 100 | 0 |
| 3 |  |  | Yes | Yes | Yes | Yes |
| 7 |  |  |  | Yes | Yes | Yes |
| 20 |  |  | Yes | Yes | Yes | Yes |
| 32 |  |  | Yes | Yes | Yes | Yes |

### 6.1.2 ∆TIB and ∆RIB values

Table 6.1.2-1: ΔTIB,c due to CA (5 bands)

|  |  |  |
| --- | --- | --- |
| **Inter-band CA Configuration** | **E-UTRA and NR Band** | **ΔTIB,c [dB]** |
| CA\_1-3-7-20-32 | 1 | 0.7 |
| 3 | 0.7 |
| 7 | 0.7 |
| 20 | 0.3 |

**Table 6.1.2-2: ΔRIB,c due to CA (5 bands)**

| Inter-band CA Configuration | E-UTRA and NR Band | ΔRIB [dB] |
| --- | --- | --- |
| CA\_1-3-7-20-32 | 1 | 0 |
| 3 | 0 |
| 7 | 0 |
| 20 | 0 |
| 32 | 0 |

### 6.1.3 REFSENS requirements

Table 6.1.3: Reference sensitivity QPSK PREFSENS

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Channel bandwidth | | | | | | | |
| E-UTRA Band | 1.4 MHz (dBm) | 3 MHz (dBm) | 5 MHz (dBm) | 10 MHz (dBm) | 15 MHz (dBm) | 20 MHz (dBm) | Duplex Mode |
| 1 |  |  | -100 | -97 | -95.2 | -94 | FDD |
| 31 |  |  | -97 | -94 | -92.2 | -91 | FDD |
| 7 |  |  |  | -95 | -93.2 | -92 | FDD |
| 20 |  |  | -97 | -94 | -91.2 | -90 | FDD |
| 32 |  |  | -100 | -97 | -95.2 | -94 | SDL |
| NOTE 1:   These requirements apply when the uplink is active in Band 1 and the separation between the lower edge of the uplink channel in Band 1 and the upper edge of the downlink channel in Band 3 is ≥ 60 MHz. For each channel bandwidth in the bands other than Band 1, the requirement applies regardless of channel bandwidth in Band 1. | | | | | | | |

### 6.1.4 REFSENS exception

Table 6.1.4-1: Reference exception QPSK PREFSENS

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Channel bandwidth | | | | | | | |
| E-UTRA Band | 1.4 MHz (dBm) | 3 MHz (dBm) | 5 MHz (dBm) | 10 MHz (dBm) | 15 MHz (dBm) | 20 MHz (dBm) | Duplex Mode |
| 1 |  |  | -100 | -97 | -95.2 | -94 | FDD |
| 31, 2 |  |  | -94 | -91 | -90 | -89 | FDD |
| 7 |  |  |  | -95 | -93.2 | -92 | FDD |
| 20 |  |  | -97 | -94 | -91.2 | -90 | FDD |
| 32 |  |  | -100 | -97 | -95.2 | -94 | SDL |
| NOTE 1:   These requirements apply when the uplink is active in Band 1 and the separation between the lower edge of the uplink channel in Band 1 and the upper edge of the downlink channel in Band 3 is < 60 MHz. For each channel bandwidth in the bands other than Band 1, the requirement applies regardless of channel bandwidth in Band 1.  NOTE 2:   Applicable for the operations with 2 or 4 antenna ports supported in the band with carrier aggregation configured. | | | | | | | |

## 6.2 CA\_1-3-7-8-20

### 6.2.1 Channel bandwidths per operating band for CA

Table 6.2.1-1: Supported E-UTRA bandwidths per CA configuration for inter-band CA

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| E-UTRA CA configuration / Bandwidth combination set | | | | | | | | | | |
| E-UTRA CA Configuration | Uplink CA configurations | E-UTRA Bands | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz | Maximum aggregated bandwidth  [MHz] | Bandwidth combination set |
| CA\_1A-3A-7A-8A-20A | - | 1 |  |  | Yes | Yes | Yes | Yes | 90 | 0 |
| 3 |  |  | Yes | Yes | Yes | Yes |
| 7 |  |  |  | Yes | Yes | Yes |
| 8 |  |  | Yes | Yes |  |  |
| 20 |  |  |  | Yes | Yes | Yes |

### 6.2.2 ΔTIB,c and ΔRIB,c values

The ΔTIB,c and ΔRIB,c values are derived from existing combination 1-3-7-20-28 with the low band 28 replaced with low band 8, and are specified by the following inclusions into tables in TS 36.101.

Table 6.2.2-1: ΔTIB,c (five bands)

|  |  |  |
| --- | --- | --- |
| E-UTRA operating band combination | E-UTRA Band | ΔTIB,c [dB] |
| CA\_1-3-7-8-20 | 1 | 0.6 |
| 3 | 0.6 |
| 7 | 0.6 |
| 8 | 0.6 |
| 20 | 0.6 |

Table 6.2.2-2: ΔRIB,c (five bands)

|  |  |  |
| --- | --- | --- |
| E-UTRA operating band combination | E-UTRA Band | ΔRIB,c [dB] |
| CA\_1-3-7-8-20 | 1 | 0 |
| 3 | 0 |
| 7 | 0 |
| 8 | 0.2 |
| 20 | 0.2 |

### 6.2.3 REFSENS requirements

The reference sensitivity requirements needed are specified by the following inclusions into tables in TS 36.101

Table 6.2.3-1: Reference sensitivity for carrier aggregation QPSK PREFSENS, CA (exceptions due to harmonic issue)

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Channel bandwidth | | | | | | | | |
| EUTRA CA Configuration | EUTRA band | 1.4 MHz (dBm) | 3 MHz (dBm) | 5 MHz (dBm) | 10 MHz (dBm) | 15 MHz (dBm) | 20 MHz (dBm) | Duplex mode |
| CA\_1A-3A-7A-8A-20A5,6 | 133 |  |  | -89.8 | -89.4 | -89 | -88.7 | FDD |
| NOTE 5: These requirements apply when there is at least one individual RE within the uplink transmission bandwidth of a low band for which the 3rd transmitter harmonic is within the downlink transmission bandwidth of a high band.  NOTE 6: The requirements should be verified for UL EARFCN of a low band (superscript LB) such that in MHz and  with the carrier  NOTE 33: Applicable for the operations with 2 or 4 antenna ports supported in the band with carrier aggregation configured. | | | | | | | | |

Table 6.2.3-2: Uplink configuration for the low band (exceptions due to harmonic issue)

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| E-UTRA Band / Channel bandwidth of the high band / NRB / Duplex mode | | | | | | | | |
| EUTRA CA Configuration | UL band | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz | Duplex mode |
| CA\_1A-3A-7A-8A-20A | 8 |  |  | 8 | 16 | 25 | 25 | FDD | |

Table 6.2.3-3: Reference sensitivity for carrier aggregation QPSK PREFSENS, CA (exceptions for five bands due to close proximity of UL to DL channel)

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Channel bandwidth | | | | | | | | |
| EUTRA CA Configuration | EUTRA band | 1.4 MHz (dBm) | 3 MHz (dBm) | 5 MHz (dBm) | 10 MHz (dBm) | 15 MHz (dBm) | 20 MHz (dBm) | Duplex mode |
| CA\_1A-3A-7A-8A-20A | 34 |  |  | -94 | -91.5 | -90 | -89 | FDD |
| 35 |  |  | -97 | -94 | -92.2 | -91 |
| NOTE 4: These requirements apply when the uplink is active in Band 1 and the separation between the lower edge of the uplink channel in Band 1 and the upper edge of the downlink channel in Band 3 is < 60 MHz. For each channel bandwidth in the bands other than Band 1, the requirement applies regardless of channel bandwidth in Band 1.  NOTE 5: These requirements apply when the uplink is active in Band 1 and the separation between the lower edge of the uplink channel in Band 1 and the upper edge of the downlink channel in Band 3 is ≥ 60 MHz. For each channel bandwidth in the bands other than Band 1, the requirement applies regardless of channel bandwidth in Band 1. | | | | | | | | |

Table 6.2.3-4: Uplink configuration for the low band (exceptions for five bands due to close proximity of UL to DL channel)

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| E-UTRA Band / Channel bandwidth / NRB / Duplex mode | | | | | | | | |
| **EUTRA CA Configuration** | UL band | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz | Duplex mode |
| CA\_1A-3A-7A-20A-28A  CA\_1A-3A-7A-20A-42A  CA\_1A-3A-20A-32A-42A  CA\_1A-3A-20A-32A-43A  CA\_1A-3A-32A-42A-43A | 11,2 |  |  | 25 | 25 | 25 | 25 | FDD |
| 11,3 |  |  | 25 | 45 | 45 | 45 |
| NOTE 1: refers to the UL resource blocks shall be located as close as possible to the downlink channel in Band 3 but confined within the transmission bandwidth configuration for the channel bandwidth (Table 5.6-1) in the uplink channel in Band 1.  NOTE 2: UL allocation when the separation between the lower edge of the uplink channel in Band 1 and the upper edge of the downlink channel in Band 3 is < 60 MHz.  NOTE 3: UL allocation when the separation between the lower edge of the uplink channel in Band 1 and the upper edge of the downlink channel in Band 3 is ≥ 60 MHz. | | | | | | | | |

## 6.3 for CA\_1-3-5-7-28

### 6.3.1 Channel bandwidths per operating band for CA

Table 5.5A-2b: Inter-band CA operating bands (four bands)

|  |  |
| --- | --- |
| E-UTRA CA Band | E-UTRA Band  (Table 5.5.1) |
| CA\_1-3-5-7-28 | 1, 3, 5, 7, 28 |
| NOTE: The frequency range in band 28 is restricted for this CA band combination to 718-748 MHz for the UL and 773-803 MHz for the DL | |

Table 6.3.1-1: Supported E-UTRA bandwidths per CA configuration for 4DL inter-band CA

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| E-UTRA CA configuration / Bandwidth combination set | | | | | | | | | | |
| E-UTRA CA Configuration | Uplink CA configurations | E-UTRA Bands | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz | Maximum aggregated bandwidth  [MHz] | Bandwidth combination set |
| CA\_1A-3A-5A-7A-28A | - | 1 |  |  | Yes | Yes | Yes |  | 85 | 0 |
| 3 |  |  | Yes | Yes | Yes | Yes |
| 5 |  |  | Yes | Yes |  |  |
| 7 |  |  |  | Yes | Yes | Yes |
| 28 |  |  | Yes | Yes | Yes | Yes |

### 6.3.2 ΔTIB,c and ΔRIB,c values

ΔRIB,c values for CA\_1-3-5-7-28 are derived from CA\_1-3-7-28, CA\_1-5-7, CA\_1-7-28 and CA\_5-7-28.

Table 6.3.2-1: ΔTIB,c (four bands)

|  |  |  |
| --- | --- | --- |
| E-UTRA operating band combination | E-UTRA Band | ΔTIB,c [dB] |
| CA\_1-3-5-7-28 | 1 | 0.6 |
| 3 | 0.6 |
| 5 | 0.5 |
| 7 | 0.6 |
| 28 | 0.6 |

Table 6.3.2-2: ΔRIB,c (four bands)

|  |  |  |
| --- | --- | --- |
| E-UTRA operating band combination | E-UTRA Band | ΔRIB,c [dB] |
| CA\_1-3-5-7-28 | 1 | 0 |
| 3 | 0 |
| 5 | 0.1 |
| 7 | 0 |
| 28 | 0.2 |

### 6.3.3 REFSENS requirements

Table 7.3.1A-0bD1: Reference sensitivity for carrier aggregation QPSK PREFSENS, CA (exceptions for four bands due to close proximity of UL to DL channel)

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Channel bandwidth | | | | | | | | |
| EUTRA CA Configuration | EUTRA band | 1.4 MHz (dBm) | 3 MHz (dBm) | 5 MHz (dBm) | 10 MHz (dBm) | 15 MHz (dBm) | 20 MHz (dBm) | Duplex mode |
| CA\_1A-3A-5A-7A-28A | 34,9 |  |  |  | -91.5 | -90 | -89 | FDD |
| 35 |  |  |  | -94 | -92.2 | -91 |
| NOTE 4: These requirements apply when the uplink is active in Band 1 and the separation between the lower edge of the uplink channel in Band 1 and the upper edge of the downlink channel in Band 3 is < 60 MHz. For each channel bandwidth in the bands other than Band 1, the requirement applies regardless of channel bandwidth in Band 1.  NOTE 5: These requirements apply when the uplink is active in Band 1 and the separation between the lower edge of the uplink channel in Band 1 and the upper edge of the downlink channel in Band 3 is ≥ 60 MHz. For each channel bandwidth in the bands other than Band 1, the requirement applies regardless of channel bandwidth in Band 1.  NOTE 9: Applicable for the operations with 2 or 4 antenna ports supported in the band with carrier aggregation configured. | | | | | | | | |

Table 7.3.1A-0bD2: Uplink configuration for the low band (exceptions for four bands due to close proximity of UL to DL channel)

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| E-UTRA Band / Channel bandwidth of the affected DL band / NRB / Duplex mode | | | | | | | | |
| **EUTRA CA Configuration** | UL band | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz | Duplex mode |
| CA\_1A-3A-5A-7A-28A | 11,2 |  |  | 25 | 25 | 25 | 25 | FDD |
| 11,3 |  |  | 25 | 45 | 45 | 45 |
| NOTE 1: refers to the UL resource blocks shall be located as close as possible to the downlink channel in Band 3 but confined within the transmission bandwidth configuration for the channel bandwidth (Table 5.6-1) in the uplink channel in Band 1.  NOTE 2: UL allocation when the separation between the lower edge of the uplink channel in Band 1 and the upper edge of the downlink channel in Band 3 is < 60 MHz  NOTE 3: UL allocation when the separation between the lower edge of the uplink channel in Band 1 and the upper edge of the downlink channel in Band 3 is ≥ 60 MHz. | | | | | | | | |

Table 7.3.1A-0a: Reference sensitivity for carrier aggregation QPSK PREFSENS, CA (exceptions due to harmonic issue)

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Channel bandwidth | | | | | | | | |
| EUTRA CA Configuration | EUTRA band | 1.4 MHz (dBm) | 3 MHz (dBm) | 5 MHz (dBm) | 10 MHz (dBm) | 15 MHz (dBm) | 20 MHz (dBm) | Duplex mode |
| CA\_1A-3A-5A-7A-28A5,6 | 133 |  |  | -89.8 | -89.4 | -89 | -88.7 | FDD |
| NOTE 5: These requirements apply when there is at least one individual RE within the uplink transmission bandwidth of a low band for which the 3rd transmitter harmonic is within the downlink transmission bandwidth of a high band.  NOTE 6: The requirements should be verified for UL EARFCN of a low band (superscript LB) such that in MHz and  with the carrier frequency of a high band in MHz and the channel bandwidth configured in the low band. | | | | | | | | |

Table 7.3.1A-0b: Uplink configuration for the low band (exceptions due to harmonic issue)

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| E-UTRA Band / Channel bandwidth of the high band / NRB / Duplex mode | | | | | | | | |
| EUTRA CA Configuration | UL band | 1.4 MHz | 3 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz | Duplex mode |
| CA\_1A-3A-5A-7A-28A | 28 |  |  | 8 | 16 | 25 | 25 | FDD |

# Annex A: Change history

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Change history** | | | | | | | |
| **Date** | **TSG #** | **TSG Doc.** | **CR** | **Rev** | **Subject/Comment** | **Old** | **New** |
| 2018-08 | 3GPP RAN4#88 |  |  |  | Initial TR skeleton |  | 0.0.1 |
| 2018-10 | 3GPP RAN4#88bis |  |  |  | The following agreed text proposals have been included:  R4-1811111; Updated scope of TR: Rel'16 LTE inter-band CA for x bands DL (x=4, 5) with 1 band UL; Nokia, Nokia Shanghai Bell  R4-1809718; TP for TR 36.716-04-01: CA\_1-3-18-42; KDDI Corporation  R4-1809719; TP for TR 36.716-04-01: CA\_1-3-41-42; KDDI Corporation  R4-1811436; TP to TR 36.716-04-01: UE co-existence studies and requirements for CA\_1-3-7-8; CHTTL  R4-1811446; TP to 36.716-04-01, six 1-3-7-28 LTE CA combinations; Ericsson, Telstra, Telefonica  R4-1811435; TP on TR 36.716-04-01 for CA\_3-28-41-42; Softbank Corp. | 0.0.1 | 0.1.0 |
| 2018-11 | 3GPP RAN4#89 |  |  |  | The following agreed text proposals have been included:  R4-1813389; Updated scope of TR: Rel'16 LTE inter-band CA for x bands DL (x=4, 5) with 1 band UL; Nokia, Nokia Shanghai Bell  R4-1813766; TP to TR 36.716-04-01: CA\_3A-7A-32A-46A, CA\_3A-7A-32A-46C, CA\_3A-7A-32A-46D and CA\_3A-7A-32A-46E; Huawei  R4-1813767; TP to TR 36.716-04-01: CA\_1A-3A-7A-20A-32A; Huawei  R4-1813768; TP for TR 36.716-04-01 for CA\_5DL\_1A-3A-7A-8A-20A\_1UL\_BCS0; Ericsson | 0.1.0 | 0.2.0 |
| 2019-04 | 3GPP RAN4#90bis |  |  |  | The following agreed text proposals have been included:  R4-1900388; Updated scope of TR: Rel'16 LTE inter-band CA for x bands DL (x=4, 5) with 1 band UL; Nokia, Nokia Shanghai Bell  R4-1902184 TP for TR 36.716-04-01 for CA\_1A-3A-7A-38A\_BCS0, CA\_1A-3C-7A-38A\_BCS0; Ericsson  R4-1900071 TP to TR 36.716-04-01: DL\_2A-5A-46X-66A and DL\_2A-5A-46X-66A-66A\_BCS0; Nokia  R4-1900072 TP to TR 36.716-04-01: DL\_2A-13A-46X-66A and DL\_2A-13A-46X-66A-66A\_BCS0; Nokia  R4-1900594 TP to TR 36.716-04-01: CA\_2-46-48-66; Nokia | 0.2.0 | 0.3.0 |
| 2019-05 | 3GPP RAN4#91 |  |  |  | The following agreed text proposals have been included:  R4-1904589; Updated scope of TR: Rel'16 LTE inter-band CA for x bands DL (x=4, 5) with 1 band UL; Nokia, Nokia Shanghai Bell  R4-1904886 TP for TR 36.716-04-01: CA\_3-7-28-40\_BCS0; Huawei  R4-1904887 TP for TR 36.716-04-01: CA\_1-3-28-40\_BCS0; Huawei  R4-1904888 TP for TR 36.716-04-01: CA\_1-7-28-40\_BCS0; Huawei | 0.3.0 | 0.4.0 |
| 2019-08 | 3GPP RAN4#92 |  |  |  | The following agreed text proposals have been included:  R4-1905347; TP for TR 36.716-04-01 for CA\_3-5-7-28 and CA\_3-3-5-7-28; Nokia  R4-1905348; TP for TR 36.716-04-01 for CA\_1-3-3-5-7; Nokia  R4-1905349; TP for TR 36.716-04-01 for CA\_1-3-5-28; Nokia  R4-1905350; TP for TR 36.716-04-01 for CA\_1-5-7-28; Nokia  R4-1905351; TP for TR 36.716-04-01 for CA\_1-3-5-7-28; Nokia  R4-1907394; TP for TR 36.716-04-01: CA\_2A-7A-29A-66A, CA\_2A-7C-29A-66A, CA\_2A-7A-7A-29A-66A; Huawei | 0.4.0 | 0.5.0 |
| 2019-10 | 3GPP RAN4#92bis |  |  |  | The following agreed text proposals have been included:  R4-1909406; Updated scope of TR: Rel'16 LTE inter-band CA for x bands DL (x=4, 5) with 1 band UL; Nokia, Nokia Shanghai Bell  R4-1910222; TP for TR 36.716-04-01: CA\_2A-7A-29A-66A, CA\_2A-7C-29A-66A, CA\_2A-7A-7A-29A-66A; Skyworks  R4-1910202; TP to TR 36.716-04-01: UE requirements for CA\_1A-3A-7A-46A to CA\_1A-3A-7A-46E; CHTTL  R4-1909843; TP for TR 36.716-04-01 to include CA configurations for 1-3-7-28; Ericsson | 0.5.0 | 0.6.0 |
| 2019-11 | 3GPP RAN4#93 |  |  |  | The following agreed text proposals have been included:  R4-1912455; Updated scope of TR: Rel'16 LTE inter-band CA for x bands DL (x=4, 5) with 1 band UL; Nokia, Nokia Shanghai Bell  R4-1911576; TP to correct inconsistent fallback BCS for CA\_1A-3A-3A-5A-7A; Nokia, Nokia Shanghai Bell  R4-1912606; TP for TR 36.716-04-01: LTE CA\_1-3-8-42; Softbank  R4-1911466; TP for TR 36.716-04-01: CA\_2A-7A-13A-66A, CA\_2A-7C-13A-66A; Huawei  R4-1911587; TP to TR 36.716-04-01: CA\_1-3-7-7-20; Nokia, Nokia Shanghai Bell  R4-1911588; TP to TR 36.716-04-01: CA\_1-3-7-28; Nokia, Nokia Shanghai Bell  R4-1912582; TP for 36.716-04-01 to include CA configurations for 1-3-7-28; Ericsson | 0.6.0 | 0.7.0 |
| 2020-02 | 3GPP RAN4#94-e |  |  |  | The following agreed text proposals have been included:  R4-1915693; TP for TR 36.716-04-01: LTE CA\_1-8-11-42; Softbank  R4-1914694; TP for TR 36.716-04-01 to align band 7 BW values for CA\_1-3-7-28 configurations; Ericsson | 0.7.0 | 0.8.0 |
| 2020-04 | 3GPP RAN4#94bis-e |  |  |  | The following agreed text proposals have been included:  R4-2000331; Updated scope of TR: Rel'16 LTE inter-band CA for x bands DL (x=4, 5) with 1 band UL; Nokia, Nokia Shanghai Bell  R4-2002634; TP to TR 36.716-04-01: CA\_2-7-26-66; Nokia, Nokia Shanghai Bell  R4-2000187 TP to TR 36.716-04-01: Correction of BCS for CA\_1A-3C-7A-28A; Nokia, Nokia Shanghai Bell  R4-2000188 TP to TR 36.716-04-01: Correction of BCS for CA\_2A-7A-7A-29A-66A; Nokia, Nokia Shanghai Bell | 0.8.0 | 0.9.0 |

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| **Change history** | | | | | | | |
| **Date** | **Meeting** | **TDoc** | **CR** | **Rev** | **Cat** | **Subject/Comment** | **New version** |
| 2020-06 | RAN#88 |  |  |  |  | Approved by plenary – Rel-16 spec under change control | 16.0.0 |