**3GPP TSG-RAN WG4 Meeting #94-e *R4-2002836***

**Electronic meeting, 24 February – 6 March 2020**

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| *CR-Form-v12.0* |
| **CHANGE REQUEST** |
|  |
|  | **38.101-2** | **CR** | **0131** | **rev** | **1** | **Current version:** | **16.2.0** |  |
|  |
| *For* [***HE******LP***](http://www.3gpp.org/3G_Specs/CRs.htm#_blank)*on using this form: comprehensive instructions can be found at* [*http://www.3gpp.org/Change-Requests*](http://www.3gpp.org/Change-Requests)*.* |
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|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| ***Proposed change affects:*** | UICC apps |  | ME | **X** | Radio Access Network |  | Core Network |  |

|  |
| --- |
|  |
| ***Title:***  | CR to TS 38.101-2: UE RF requirements for introduction of band n259 |
|  |  |
| ***Source to WG:*** | Ericsson |
| ***Source to TSG:*** | R4 |
|  |  |
| ***Work item code:*** |  NR\_n259-Core |  | ***Date:*** | 2020-02-20 |
|  |  |  |  |  |
| ***Category:*** | **B** |  | ***Release:*** | Rel-16 |
|  | *Use one of the following categories:****F*** *(correction)****A*** *(mirror corresponding to a change in an earlier release)****B*** *(addition of feature),* ***C*** *(functional modification of feature)****D*** *(editorial modification)*Detailed explanations of the above categories canbe found in 3GPP [TR 21.900](http://www.3gpp.org/ftp/Specs/html-info/21900.htm). | *Use one of the following releases:Rel-8 (Release 8)Rel-9 (Release 9)Rel-10 (Release 10)Rel-11 (Release 11)Rel-12 (Release 12)**Rel-13 (Release 13)Rel-14 (Release 14)Rel-15 (Release 15)Rel-16 (Release 16)* |
|  |  |
| ***Reason for change:*** | Band n259 is a new band. The UE RF requirements should be introduced in technical specifications. |
|  |  |
| ***Summary of change:*** | All sections with band specific requirements are modified to include band n259 UE RF rrequirements. |
|  |  |
| ***Consequences if not approved:*** |  UE RF requirements for Band n259 cannot be referred. |
|  |  |
| ***Clauses affected:*** | 5.2, 5.3.5, 5.4.2.3, 5.4.3.3, 6.2.1.3, 6.2.4, 6.2A.4, 6.3.1.1, 6.3.1.2, 6.3.2, 6.3A.1.1, 6.3A.1.2, 6.3A.2, 6.5.2.3, 6.5.3.1, 6.5A.2.3, 6.5A.3.1, 7.3.2.3, 7.3.4.3, 7.5, 7.5A, 7.6.2, 7.6A.2 |
|  |  |
|  | **Y** | **N** |  |  |
| ***Other specs*** |  | **X** |  Other core specifications  |   |
| ***affected:*** |  | **X** |  Test specifications |   |
| ***(show related CRs)*** |  | **X** |  O&M Specifications |   |
|  |  |
| ***Other comments:*** |  |
|  |  |
| ***This CR's revision history:*** |  |

*------------------------------------------------------< start of changes >-----------------------------------------------------------------*

## 5.2 Operating bands

NR is designed to operate in the FR2 operating bands defined in Table 5.2-1.

Table 5.2-1: NR operating bands in FR2

|  |  |  |  |
| --- | --- | --- | --- |
| Operating Band | Uplink (UL) operating bandBS receiveUE transmit | Downlink (DL) operating bandBS transmit UE receive | Duplex Mode |
| FUL\_low – FUL\_high | FDL\_low – FDL\_high |
| n257 | 26500 MHz | – | 29500 MHz  | 26500 MHz | – | 29500 MHz  | TDD |
| n258 | 24250 MHz | – | 27500 MHz | 24250 MHz | – | 27500 MHz | TDD |
| n259 |  39500 MHz – 43500 MHz | 39500 MHz – 43500 MHz | TDD |
| n260 | 37000 MHz | – | 40000 MHz | 37000 MHz | – | 40000 MHz | TDD |
| n261 | 27500 MHz | – | 28350 MHz | 27500 MHz | – | 28350 MHz | TDD |

## 5.2A Operating bands for CA

### 5.2A.1 Intra-band CA

NR intra-band contiguous carrier aggregation is designed to operate in the operating bands defined in Table 5.2A.1-1, where all operating bands are within FR2.

Table 5.2A.1-1: Intra-band contiguous CA operating bands in FR2

|  |  |
| --- | --- |
| NR CA Band | NR Band(Table 5.2-1) |
| CA\_n257 | n257 |
| CA\_n258 | n258 |
| CA\_n259 | n259 |
| CA\_n260 | n260 |
| CA\_n261 | n261 |

### 5.2A.2 Void

## 5.2D Operating bands for UL MIMO

NR UL MIMO is designed to operate in the operating bands defined in Table 5.2D-1.

Table 5.2D-1: NR UL MIMO operating bands

|  |
| --- |
| UL MIMO operating band(Table 5.2-1) |
| n257 |
| n258 |
| n259 |
| n260 |
| n261 |

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5.3.5 Channel bandwidth per operating band

The requirements in this specification apply to the combination of channel bandwidths, SCS and operating bands shown in Table 5.3.5-1. The transmission bandwidth configuration in Table 5.3.2-1 shall be supported for each of the specified channel bandwidths. The channel bandwidths are specified for both the Tx and Rx path.

Table 5.3.5-1: Channel bandwidths for each NR band

|  |
| --- |
| Operating band / SCS / UE channel bandwidth |
| Operating band | SCSkHz | 50 MHz | 100 MHz | 200MHz | 4001 MHz |
| n257 | 60 | Yes | Yes | Yes |  |
| 120 | Yes | Yes | Yes | Yes |
| n258 | 60 | Yes | Yes | Yes |  |
| 120 | Yes | Yes | Yes | Yes |
| n259 | 60 | Yes | Yes | Yes |  |
| 120 | Yes | Yes | Yes | Yes |
| n260 | 60 | Yes | Yes | Yes |  |
| 120 | Yes | Yes | Yes | Yes |
| n261 | 60 | Yes | Yes | Yes |  |
| 120 | Yes | Yes | Yes | Yes |
| NOTE 1: This UE channel bandwidth is optional in this release of the specification. |

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#### 5.4.2.3 Channel raster entries for each operating band

The RF channel positions on the channel raster in each NR operating band are given through the applicable NR-ARFCN in Table 5.4.2.3‑1, using the channel raster to resource element mapping in clause 5.4.2.2.

- For NR operating bands with 60 kHz channel raster above 24 GHz, ΔFRaster = *I* ×ΔFGlobal , where *I* ϵ *{1,2}*. Every *Ith* NR‑ARFCN within the operating band are applicable for the channel raster within the operating band and the step size for the channel raster in table 5.4.2.3-1 is given as <*I*>.

- In frequency bands with two ΔFRaster, the higher ΔFRaster applies to channels using only the SCS that equals the higher ΔFRaster  and the SSB SCS that is equal to or larger than the higher ΔFRaster.

Table 5.4.2.3-1: Applicable NR-ARFCN per operating band

|  |  |  |
| --- | --- | --- |
| Operating Band | ΔFRaster(kHz)  | Uplink and DownlinkRange of NREF(First – <Step size> – Last) |
| n257 | 60 | 2054166 – <1> – 2104165 |
| 120 | 2054167 – <2> – 2104165 |
| n258 | 60 | 2016667 – <1> – 2070832 |
| 120 | 2016667 – <2> – 2070831 |
| n259 | 60 | 2270832 – <1> – 2337499 |
| 120 | 2270832– <2> – 2337499 |
| n260 | 60 | 2229166 – <1> – 2279165 |
| 120 | 2229167 – <2> – 2279165 |
| n261 | 60 | 2070833 – <1> – 2084999 |
| 120 | 2070833 – <2> – 2084999 |

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#### 5.4.3.3 Synchronization raster entries for each operating band

The synchronization raster for each band is give in Table 5.4.3.3-1. The distance between applicable GSCN entries is given by the <Step size> indicated in Table 5.4.3.3-1.

Table 5.4.3.3-1: Applicable SS raster entries per operating band

|  |  |  |  |
| --- | --- | --- | --- |
| NR Operating Band | SS Block SCS | SS Block pattern1 | Range of GSCN(First – <Step size> – Last) |
| n257  | 120 kHz | Case D | 22388 - <1> - 22558 |
| 240 kHz | Case E | 22390 - <2> - 22556 |
| n258 | 120 kHz | Case D | 22257 - <1> - 22443 |
| 240 kHz | Case E | 22258 - <2> - 22442 |
| n259 | 120 kHz | Case D | 23140 – <1> – 23369 |
| 240 kHz | Case E | 23142 – <2> – 23368 |
| n260  | 120 kHz | Case D | 22995 - <1> - 23166 |
| 240 kHz | Case E | 22996 - <2> - 23164 |
| n261 | 120 kHz | Case D | 22446 - <1> - 22492 |
| 240 kHz | Case E | 22446 - <2> - 22490 |
| NOTE 1: SS Block pattern is defined in clause 4.1 in TS 38.213 [10]. |

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#### 6.2.1.3 UE maximum output power for power class 3

The following requirements define the maximum output power radiated by the UE for any transmission bandwidth within the channel bandwidth for non-CA configuration, unless otherwise stated. The period of measurement shall be at least one sub frame (1ms). The requirement is verified with the test metric of total component of EIRP (Link=Beam peak search grids, Meas=Link angle). The requirement for the UE which supports a single FR2 band is specified in Table 6.2.1.3-1. The requirement for the UE which supports multiple FR2 bands is specified in both Table 6.2.1.3-1 and Table 6.2.1.3-4.

Table 6.2.1.3-1: UE minimum peak EIRP for power class 3

|  |  |
| --- | --- |
| Operating band | Min peak EIRP (dBm) |
| n257 | 22.4 |
| n258 | 22.4 |
| n259 | 18.7 |
| n260 | 20.6 |
| n261 | 22.4 |
| NOTE 1: Minimum peak EIRP is defined as the lower limit without toleranceNOTE 2: Void |

The maximum output power values for TRP and EIRP are found on the Table 6.2.1.3-2. The max allowed EIRP is derived from regulatory requirements [8]. The requirements are verified with the test metrics of TRP (Link=TX beam peak direction) in beam locked mode and the total component of EIRP (Link=TX beam peak direction, Meas=Link angle).

Table 6.2.1.3-2: UE maximum output power limits for power class 3

|  |  |  |
| --- | --- | --- |
| Operating band | Max TRP (dBm) | Max EIRP (dBm) |
| n257 | 23 | 43 |
| n258 | 23 | 43 |
| n259 | 23 | 43 |
| n260 | 23 | 43 |
| n261 | 23 | 43 |

The minimum EIRP at the 50th percentile of the distribution of radiated power measured over the full sphere around the UE is defined as the spherical coverage requirement and is found in Table 6.2.1.3-3 below. The requirement is verified with the test metric of the total component of EIRP (Link=Beam peak search grids, Meas=Link angle). The requirement for the UE which supports a single FR2 band is specified in Table 6.2.1.3-3. The requirement for the UE which supports multiple FR2 bands is specified in both Table 6.2.1.3-3 and Table 6.2.1.3-4.

Table 6.2.1.3-3: UE spherical coverage for power class 3

|  |  |
| --- | --- |
| Operating band | Min EIRP at 50%-tile CDF (dBm) |
| n257 | 11.5 |
| n258 | 11.5 |
| n259 | 5.8 |
| n260 | 8 |
| n261 | 11.5 |
| NOTE 1: Minimum EIRP at 50 %-tile CDF is defined as the lower limit without toleranceNOTE 2: VoidNOTE 3: The requirements in this table are verified only under normal temperature conditions as defined in Annex E.2.1. |

For the UEs that support multiple FR2 bands, minimum requirement for peak EIRP and EIRP spherical coverage in Tables 6.2.1.3-1 and 6.2.1.3-3 shall be decreased per band, respectively, by the peak EIRP relaxation parameter MBP,n and EIRP spherical coverage relaxation parameter MBS,n. For each combination of supported bands ΔMBP,n and ΔMBS,n apply to each supported band *n*, such that the total relaxations, ∑MBP and ∑MBS, across all supported bands shall not exceed the total value indicated in Table 6.2.1.3-4.

Table 6.2.1.3-4: UE multi-band relaxation factors for power class 3

|  |  |  |
| --- | --- | --- |
| Supported bands | ∑MBP (dB) | ∑MBS (dB) |
| n257, n258 | ≤ 1.3 | ≤ 1.25 |
| n257, n260n258, n260 | ≤ 1.0 | ≤ 0.753 |
| n257, n261 | 0.0 | 0.0 |
| n258, n261 | ≤ 1.0 | ≤ 1.25 |
| n260, n261 | 0.0 | ≤ 0.752 |
| n257, n258, n260n257, n258, n261n257, n258, n260, n261 | ≤ 1.7 | ≤ 1.753 |
| n257, n260, n261 | ≤ 0.5 | ≤ 1.253 |
| n258, n260, n261 | ≤ 1.5 | ≤ 1.253 |
| NOTE 1: The requirements in this table are applicable to UEs which support only the indicated bandsNOTE 2: For supported bands n260 + n261, ΔMBS,n is not applied for band n260NOTE 3: For n260, maximum applicable MBS,n is 0.4 dB |

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### 6.2.4 Configured transmitted power

The UE can configure its maximum output power. The configured UE maximum output power PCMAX,f,c for carrier f of a serving cell c is defined as that available to the reference point of a given transmitter branch that corresponds to the reference point of the higher-layer filtered RSRP measurement as specified in TS 38.215 [11].

The configured UE maximum output power PCMAX,f,c for carrier *f* of a serving cell *c* shall be set such that the corresponding measured peak EIRP PUMAX,f,c is within the following bounds

PPowerclass – MAX(MAX(MPRf,c, A- MPRf,c,) + ΔMBP,n, P-MPRf,c) – MAX{T(MAX(MPRf,c, A- MPRf,c,)), T(P-MPRf,c)} ≤ PUMAX,f,c ≤ EIRPmax

while the corresponding measured total radiated power PTMAX,f,c is bounded by

PTMAX,f,c ≤ TRPmax

with PPowerclass the UE power class as specified in sub-clause 6.2.1, EIRPmax the applicable maximum EIRP as specified in sub-clause 6.2.1, MPRf,c as specified in sub-clause 6.2.2 , A-MPRf,c as specified in sub-clause 6.2.3, ΔMBP,n the peak EIRP relaxation as specified in clause 6.2.1 and TRPmax the maximum TRP for the UE power class as specified in sub-clause 6.2.1.

*maxUplinkDutyCycle-FR2,* as defined in TS 38.306 [14], is a UE capability to facilitate electromagnetic power density exposure requirements. This UE capability is applicable to all FR2 power classes.

If the field of UE capability *maxUplinkDutyCycle-FR2* is present and the percentage of uplink symbols transmitted within any 1 s evaluation period is larger than *maxUplinkDutyCycle-FR2*, the UE follows the uplink scheduling and can apply P-MPRf,c.

If the field of UE capability *maxUplinkDutyCycle-FR2* is absent, the compliance to electromagnetic power density exposure requirements are ensured by means of scaling down the power density or by other means.

P-MPRf,c is the allowed maximum output power reduction. The UE shall apply P-MPRf,c for carrier f of serving cell c only for the cases described below. For UE conformance testing P-MPRf,c shall be 0 dB.

a) ensuring compliance with applicable electromagnetic power density exposure requirements and addressing unwanted emissions / self desense requirements in case of simultaneous transmissions on multiple RAT(s) for scenarios not in scope of 3GPP RAN specifications;

b) ensuring compliance with applicable electromagnetic power density exposure requirements in case of proximity detection is used to address such requirements that require a lower maximum output power.

NOTE 1: P-MPRf,c was introduced in the PCMAX,f,c equation such that the UE can report to the gNB the available maximum output transmit power. This information can be used by the gNB for scheduling decisions.

NOTE 2: P-MPRf,c and *maxUplinkDutyCycle-FR2* may impact the maximum uplink performance for the selected UL transmission path.

The tolerance T(∆P) for applicable values of ∆P (values in dB) is specified in Table 6.2.4-1.

Table 6.2.4-1: PUMAX,f,c tolerance

|  |  |  |
| --- | --- | --- |
| Operating Band | ∆P (dB) | Tolerance T(∆P)(dB) |
| n257, n258, n259, n260, n261 |  P = 0  | 0 |
| 0 < P ≤ 2 | 1.5 |
| 2 < P ≤ 3 | 2.0 |
| 3 < P ≤ 4 | 3.0 |
| 4 < P ≤ 5 | 4.0 |
| 5 < P ≤ 10 | 5.0 |
| 10 < P ≤ 15 | 7.0 |
| 15 < P ≤ X | 8.0 |
| NOTE: X is the value such that Pumax,f,c lower bound, PPowerclass - P – T(P) = minimum output power specified in clause 6.3.1 |

*--------------------------------------------------------< Remove of unchnged sections >-----------------------------------------------*

### 6.2A.4 Configured transmitted power for CA

A UE configured with carrier aggregation can configure its maximum output power for each uplink carrier *f* of activated serving cell *c* and its total configured output power PCMAX. The definition of the configured UE maximum output power PCMAX,*f,c* for each carrier *f* of a serving cell *c* is used for power headroom reporting for carrier *f* of serving cell *c* only and is in accordance with that specified in clause 6.2.4 with parameters MPR, A-MPR and P-MPR replaced with those specified below. The total configured power PCMAX in a transmission occasion is the sum of the configured power for carrier *f* of serving cell *c* with non-zero granted transmission power in the respective reference point.

For uplink intra-band contiguous carrier aggregation, MPR is specified in clause 6.2A.2. PCMAX is calculated under the assumption that power spectral density for each RB in each component carrier is same.

The total configured UE maximum output power PCMAX shall be set such that the corresponding measured total peak EIRP PUMAX is within the following bounds

PPowerclass – MAX(MAX(MPR, A\_MPR),P-MPR) – MAX{T(MAX(MPR, A\_MPR)),T(P-MPR)} ≤ PUMAX ≤ EIRPmax

with PPowerclass the UE power class as specified in sub-clause 6.2A.1, EIRPmax the applicable maximum EIRP as specified in sub-clause 6.2A.1, MPR as specified in sub-clause 6.2A.2, A-MPR as specified in sub-clause 6.2A.3, P-MPR the power management term for the UE as described in 6.2.4 and TRPmax the maximum TRP for the UE power class as specified in sub-clause 6.2A.1.

PUMAX is defined as 10\*log10(∑pUMAX,fIi),c(j)) for each carrier f (i=1…n) and serving cell c (j=1…m) where pUMAX,fIi),c(j) is linear value of PUMAX,fIi),c(j)

The tolerance T(ΔP) for applicable values of ΔP (values in dB) is specified in Table 6.2A.4-1.

Table 6.2A.4-1: PUMAX tolerance

|  |  |  |
| --- | --- | --- |
| Operating Band | ∆P (dB) | Tolerance T(∆P)(dB) |
| n257, n258, n259, n260, n261 |  P = 0  | 0 |
| 0 < P ≤ 2 | 1.5 |
| 2 < P ≤ 3 | 2.0 |
| 3 < P ≤ 4 | 3.0 |
| 4 < P ≤ 5 | 4.0 |
| 5 < P ≤ 10 | 5.0 |
| 10 < P ≤ 15 | 7.0 |
| 15 < P ≤ X | 8.0 |
| NOTE: X is the value such that Pumax lower bound, PPowerclass - P – T(P) = minimum output power specified in clause 6.3A.1 |

*--------------------------------------------------------< Remove of unchnged sections >-----------------------------------------------*

#### 6.3.1.2 Minimum output power for power class 2, 3, and 4

The minimum output power shall not exceed the values specified in Table 6.3.1.2-1 for each operating band supported. The minimum power is verified in beam locked mode with the test metric of EIRP (Link=TX beam peak direction, Meas=Link angle).

Table 6.3.1.2-1: Minimum output power for power class 2, 3, and 4

|  |  |  |  |
| --- | --- | --- | --- |
| Operating band | Channel bandwidth(MHz) | Minimum output power(dBm) | Measurement bandwidth(MHz) |
| n257, n258, n259, n260, n261 | 50 | -13 | 47.52 |
| 100 | -13 | 95.04 |
| 200 | -13 | 190.08 |
| 400 | -13 | 380.16 |
| NOTE 1: n260 and n259 are not applied for power class 2. |

### 6.3.2 Transmit OFF power

The transmit OFF power is defined as the TRP in the channel bandwidth when the transmitter is OFF. The transmitter is considered OFF when the UE is not allowed to transmit on any of its ports.

The transmit OFF power shall not exceed the values specified in Table 6.3.2-1 for each operating band supported. The requirement is verified with the test metric of TRP (Link=TX beam peak direction).

Table 6.3.2-1: Transmit OFF power

|  |  |
| --- | --- |
| Operating band | Channel bandwidth / Transmit OFF power (dBm) / measurement bandwidth |
| 50 MHz | 100 MHz | 200 MHz | 400 MHz |
| n257, n258, n259, n260, n261 | -35 | -35 | -35 | -35 |
| 47.52 MHz | 95.04 MHz | 190.08 MHz | 380.16 MHz |

*--------------------------------------------------------< Remove of unchnged sections >-----------------------------------------------*

#### 6.3A.1.2 Minimum output power for power class 2, 3, and 4

The minimum output power shall not exceed the values specified in Table 6.3A.1.2-1 for each operating band supported. The minimum power is verified in beam locked mode with the test metric of EIRP (Link=TX beam peak direction, Meas=Link angle).

Table 6.3A.1.2-1: Minimum output power for CA for power class 2, 3, and 4

|  |  |  |  |
| --- | --- | --- | --- |
| Operating band | Channel bandwidth(MHz) | Minimum output power(dBm) | Measurement bandwidth(MHz) |
| n257, n258, n259, n260, n261 | 50 | -13 | 47.52 |
| 100 | -13 | 95.04 |
| 200 | -13 | 190.08 |
| 400 | -13 | 380.16 |
| NOTE 1: n260 and n259 are not applied for power class 2. |

### 6.3A.2 Transmit OFF power for CA

For intra-band contiguous carrier aggregation, the transmit OFF power is defined as the TRP in the channel bandwidth per component carrier when the transmitter is OFF. The transmitter is considered OFF when the UE is not allowed to transmit on any of it sports.

The transmit OFF power shall not exceed the values specified in Table 6.3A.2-1 for each operating band supported.

Table 6.3A.2-1: Transmit OFF power for CA

|  |  |
| --- | --- |
| Operating band | Channel bandwidth / Transmit OFF power (dBm) / measurement bandwidth |
| 50 MHz | 100 MHz | 200 MHz | 400 MHz |
| n257, n258, n259, n260, n261 | -35 | -35 | -35 | -35 |
| 47.52 MHz | 95.04 MHz | 190.08 MHz | 380.16 MHz |

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#### 6.5.2.3 Adjacent channel leakage ratio

Adjacent Channel Leakage power Ratio (ACLR) is the ratio of the filtered mean power centred on the assigned channel frequency to the filtered mean power centred on an adjacent channel frequency. ACLR requirement is specified for a scenario in which adjacent carrier is another NRchannel.

NR Adjacent Channel Leakage power Ratio (NRACLR) is the ratio of the filtered mean power centred on the assigned channel frequency to the filtered mean power centred on an adjacent channel frequency at nominal channel spacing. The assigned NR channel power and adjacent NR channel power are measured with rectangular filters with measurement bandwidths specified in Table 6.5.2.3-1.

If the measured adjacent channel power is greater than –35 dBm then the NRACLR shall be higher than the value specified in Table 6.5.2.3-1. The requirement is verified in beam locked mode with the test metric of TRP (Link=TX beam peak direction).

Table 6.5.2.3-1: General requirements for NRACLR

|  |  |
| --- | --- |
|  | Channel bandwidth / NRACLR / Measurement bandwidth |
| 50MHz | 100MHz | 200MHz | 400MHz |
| NRACLR for band n257, n258, n261 | 17 dB | 17 dB | 17 dB | 17 dB |
| NRACLR for band n259, n260 | 16 dB | 16 dB | 16 dB | 16 dB |
| NR channel measurement bandwidth | 47.52 MHz | 95.04 MHz | 190.08 MHz | 380.16 MHz |
| Adjacent channel centre frequency offset (MHz) | +50/-50 | +100.0/-100.0 | +200/-200 | +400/-400 |

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#### 6.5.3.1 Spurious emission band UE co-existence

This clause specifies the requirements for the specified NR band, for coexistence with protected bands.

NOTE: For measurement conditions at the edge of each frequency range, the lowest frequency of the measurement position in each frequency range should be set at the lowest boundary of the frequency range plus MBW/2. The highest frequency of the measurement position in each frequency range should be set at the highest boundary of the frequency range minus MBW/2. MBW denotes the measurement bandwidth defined for the protected band.

Table 6.5.3.1-1: Requirements

|  |  |
| --- | --- |
| NR Band | Spurious emission  |
| Protected band/frequency range | Frequency range (MHz) | Maximum Level (dBm) | MBW (MHz) |
| n257 | NR Band n260 | FDL\_low  | - | FDL\_high | -2 | 100 |
| Frequency range | 57000 | - | 66000 | 2 | 100 |
| n258 | Frequency range | 57000 | - | 66000 | 2 | 100 |
| n259 | NR Band 257 | FDL\_low  | - | FDL\_high | -5 | 100 |
| NR Band 261 | FDL\_low  | - | FDL\_high | -5 | 100 |
| n260 | NR Band 257 | FDL\_low  | - | FDL\_high | -5 | 100 |
| NR Band 261 | FDL\_low  | - | FDL\_high | -5 | 100 |
| Frequency range | 57000 | - | 66000 | 2 | 100 |
| n261 | NR Band 260 | FDL\_low  | - | FDL\_high | -2 | 100 |
| Frequency range | 57000 | - | 66000 | 2 | 100 |
| NOTE 1: FDL\_low and FDL\_high refer to each NR frequency band specified in Table 5.2-1NOTE 2: Void |

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#### 6.5A.2.3 Adjacent channel leakage ratio for CA

For intra-band contiguous carrier aggregation, the carrier aggregation NR adjacent channel leakage power ratio (CA NRACLR) is the ratio of the filtered mean power centred on the aggregated channel bandwidth to the filtered mean power centred on an adjacent aggregated channel bandwidth at spacing equal to the aggregated channel bandwidth. The assigned aggregated channel bandwidth power and adjacent aggregated channel bandwidth power are measured with rectangular filters with measurement bandwidths specified in 6.5A.2.3-1. If the measured adjacent channel power is greater than -35 dBm then the NRACLR shall be higher than the value specified in Table 6.5A.2.3-1.

Table 6.5A.2.3-1: General requirements for CA NRACLR

|  |  |
| --- | --- |
|  | CA bandwidth class / CA NRACLR / Measurement bandwidth |
| Any CA bandwidth class |
| CA NRACLR for band n257, n258, n261 | 17 dB |
| CA NRACLR for band n259, n260 | 16 dB |
| NR channel measurement bandwidth1 | BWChannel\_CA – 2\*BWGB |
| Adjacent channel centre frequency offset (in MHz) | + BWChannel\_CA/- BWChannel\_CA |
| NOTE 1: BWGB is defined in clause 5.3A.2.  |

*--------------------------------------------------------< Remove of unchnged sections >-----------------------------------------------*

#### 6.5A.3.1 Spurious emission band UE co-existence for CA

This clause specifies the requirements for the specified carrier aggregation configurations for coexistence with protected bands.

NOTE: For measurement conditions at the edge of each frequency range, the lowest frequency of the measurement position in each frequency range should be set at the lowest boundary of the frequency range plus MBW/2. The highest frequency of the measurement position in each frequency range should be set at the highest boundary of the frequency range minus MBW/2. MBW denotes the measurement bandwidth defined for the protected band.

For intra-band contiguous carrier aggregation, the requirements in Table 6.5A.3-1 apply.

Table 6.5A.3-1: Requirements for CA

|  |  |
| --- | --- |
| UL CA for any CA bandwidth class | Spurious emission  |
| Protected band / frequency range | Frequency range (MHz) | Maximum Level (dBm) | MBW (MHz) | NOTE |
| CA\_n257 | NR Band n260 | FDL\_low  | - | FDL\_high | -2 | 100 |  |
| Frequency range | 23600 | - | 24000 | -8 | 200 | 2 |
| Frequency range | 57000 | - | 66000 | 2 | 100 |  |
| CA\_n258 | Frequency range | 23600 | - | 24000 | -8 | 200 | 2 |
| Frequency range | 57000 | - | 66000 | 2 | 100 |  |
| CA\_n259 | NR Band 257 | FDL\_low  | - | FDL\_high | -5 | 100 |  |
| NR Band 261 | FDL\_low  | - | FDL\_high | -5 | 100 |  |
| Frequency range | 23600 | - | 24000 | -8 | 200 | 2 |
| Frequency range | 57000 | - | 66000 | 2 | 100 |  |
| CA\_n260 | NR Band 257 | FDL\_low  | - | FDL\_high | -5 | 100 |  |
| NR Band 261 | FDL\_low  | - | FDL\_high | -5 | 100 |  |
| Frequency range | 23600 | - | 24000 | -8 | 200 | 2 |
| Frequency range | 57000 | - | 66000 | 2 | 100 |  |
| CA\_n261 | NR Band 260 | FDL\_low  | - | FDL\_high | -2 | 100 |  |
| Frequency range | 23600 | - | 24000 | -8 | 200 | 2 |
| Frequency range | 57000 | - | 66000 | 2 | 100 |  |
| NOTE 1: FDL\_low and FDL\_high refer to each NR frequency band specified in Table 5.2-1NOTE 2: The protection of frequency range 23600 - 2400 MHz is meant for protection of satellite passive services. |

*--------------------------------------------------------< Remove of unchnged sections >-----------------------------------------------*

#### 7.3.2.3 Reference sensitivity power level for power class 3

The throughput shall be ≥ 95 % of the maximum throughput of the reference measurement channels as specified in Annexes A.2.3.2 and A.3.3.2 (with one sided dynamic OCNG Pattern OP.1 TDD for the DL-signal as described in Annex A.5.2.1) with peak reference sensitivity specified in Table 7.3.2.3-1. The requirement is verified with the test metric of EIS (Link=Beam peak search grids, Meas=Link Angle).

For the UEs that support multiple FR2 bands, the minimum requirement for Reference sensitivity in Table 7.3.2.3-1 shall be increased per band, respectively, by the reference sensitivity relaxation parameter ∆MBP,n as specified in clause 6.2.1.3. The requirement for the UE which supports a single FR2 band is specified in Table 7.3.2.3-1. The requirement for the UE which supports multiple FR2 bands is specified in both Table 7.3.2.3-1 and Table 6.2.1.3-4.

Table 7.3.2.3-1: Reference sensitivity

|  |  |
| --- | --- |
| Operating band | REFSENS (dBm) / Channel bandwidth |
| 50 MHz | 100 MHz | 200 MHz | 400 MHz |
| n257 | -88.3 | -85.3 | -82.3 | -79.3 |
| n258 | -88.3 | -85.3 | -82.3 | -79.3 |
| n259 | -84.7 | -81.7 | -78.7 | -75.7 |
| n260 | -85.7 | -82.7 | -79.7 | -76.7 |
| n261 | -88.3 | -85.3 | -82.3 | -79.3 |
| NOTE 1: The transmitter shall be set to PUMAX as defined in clause 6.2.4 |

The REFSENS requirement shall be met for an uplink transmission using QPSK DFT-s-OFDM waveforms and for uplink transmission bandwidth less than or equal to that specified in Table 7.3.2.1-2.

Unless given by Table 7.3.2.1-3, the minimum requirements for reference sensitivity shall be verified with the network signalling value NS\_200 (Table 6.2.3-1) configured.

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#### 7.3.4.3 EIS spherical coverage for power class 3

The reference measurement channels and throughput criterion shall be as specified in clause 7.3.2.3

The maximum EIS at the 50th percentile of the CCDF of EIS measured over the full sphere around the UE is defined as the spherical coverage requirement and is found in Table 7.3.4.3-1 below. The requirement is verified with the test metric of EIS (Link=Beam peak search grids, Meas=Link angle).

For the UEs that support multiple FR2 bands, the minimum requirement for EIS spherical coverage in Table 7.3.4.3-1 shall be increased per band, respectively, by the EIS spherical coveragerelaxation parameter ∆MBS,n as specified in clause 6.2.1.3. The requirement for the UE which supports a single FR2 band is specified in Table 7.3.4.3-1. The requirement for the UE which supports multiple FR2 bands is specified in both Table 7.3.4.3-1 and Table 6.2.1.3-4.

Table 7.3.4.3-1: EIS spherical coverage for power class 3

|  |  |
| --- | --- |
| **Operating band** | **EIS at 50th %-tile CCDF (dBm) / Channel bandwidth** |
| **50 MHz** | **100 MHz** | **200 MHz** | **400 MHz** |
| n257 | -77.4 | -74.4 | -71.4 | -68.4 |
| n258 | -77.4 | -74.4 | -71.4 | -68.4 |
| n259 | -71.9 | -68.9 | -65.9 | -62.9 |
| n260 | -73.1 | -70.1 | -67.1 | -64.1 |
| n261 | -77.4 | -74.4 | -71.4 | -68.4 |
| NOTE 1: The transmitter shall be set to PUMAX as defined in clause 6.2.4NOTE 2: The EIS spherical coverage requirements are verified only under normal thermal conditions as defined in Annex E.2.1. |

The requirement shall be met for an uplink transmission using QPSK DFT-s-OFDM waveforms and for uplink transmission bandwidth less than or equal to that specified in Table 7.3.2.1-2.

Unless given by Table 7.3.2.1-3, the minimum requirements for reference sensitivity shall be verified with the network signalling value NS\_200 (Table 6.2.3-1) configured.

*--------------------------------------------------------< Remove of unchnged sections >-----------------------------------------------*

## 7.5 Adjacent channel selectivity

Adjacent Channel Selectivity (ACS) is a measure of a receiver's ability to receive a NR signal at its assigned channel frequency in the presence of an adjacent channel signal at a given frequency offset from the centre frequency of the assigned channel. ACS is the ratio of the receive filter attenuation on the assigned channel frequency to the receive filter attenuation on the adjacent channel(s).

The requirement applies at the RIB when the AoA of the incident wave of the wanted signal and the interfering signal are both from the direction where peak gain is achieved.

The wanted and interfering signals apply to all supported polarizations, under the assumption of polarization match.

The UE shall fulfil the minimum requirement specified in Table 7.5-1 for all values of an adjacent channel interferer up to –25 dBm. However, it is not possible to directly measure the ACS, instead the lower and upper range of test parameters are chosen in Table 7.5-2 and Table 7.5-3 where the throughput shall be ≥ 95 % of the maximum throughput of the reference measurement channels as specified in Annexes A.2.3.2 and A.3.3.2, with one sided dynamic OCNG Pattern OP.1 TDD for the DL-signal as described in Annex A.5.2.1. The requirement is verified with the test metric of EIS (Link=RX beam peak direction, Meas=Link angle).

Table 7.5-1: Adjacent channel selectivity

|  |  |  |
| --- | --- | --- |
| Operating band | Units | Adjacent channel selectivity / Channel bandwidth |
| 50MHz  | 100MHz | 200MHz | 400MHz |
| n257, n258, n261 | dB | 23 | 23 | 23 | 23 |
| n259, n260 | dB | 22 | 22 | 22 | 22 |

Table 7.5-2: Test parameters for adjacent channel selectivity, Case 1

|  |  |  |
| --- | --- | --- |
| Rx Parameter | Units  | Channel bandwidth |
| 50 MHz  | 100 MHz | 200 MHz | 400 MHz |
| Power in Transmission Bandwidth Configuration | dBm | REFSENS + 14 dB |
| PInterferer for band n257, n258, n261 | dBm | REFSENS + 35.5 dB | REFSENS +35.5 dB | REFSENS +35.5 dB | REFSENS +35.5 dB |
| PInterferer for band n260 | dBm | REFSENS + 34.5 dB | REFSENS +34.5 dB | REFSENS +34.5 dB | REFSENS +34.5 dB |
| BWInterferer  | MHz | 50 | 100 | 200 | 400 |
| FInterferer (offset) | MHz | 50/-50NOTE 3 | 100/-100NOTE 3 | 200/-200NOTE 3 | 400/-400NOTE 3 |
| NOTE 1: The interferer consists of the Reference measurement channel specified in Annex A.3.2 with one sided dynamic OCNG Pattern as described in Annex A.3.2 and set-up according to Annex C.NOTE 2: The REFSENS power level is specified in Clause 7.3.2, which are applicable to different UE power classes.NOTE 3: The absolute value of the interferer offset FInterferer (offset) shall be further adjusted to (CEIL(|FInterferer|/SCS) + 0.5)\*SCS MHz with SCS the sub-carrier spacing of the wanted signal in MHz. Wanted and interferer signal have same SCS. |

Table 7.5-3: Test parameters for adjacent channel selectivity, Case 2

|  |  |  |
| --- | --- | --- |
| Rx Parameter | Units  | Channel bandwidth |
| 50 MHz  | 100 MHz | 200 MHz | 400 MHz |
| Power in Transmission Bandwidth Configuration for band n257, n258, n261 | dBm | -46.5 | -46.5 | -46.5 | -46.5 |
| Power in Transmission Bandwidth Configuration for band n260 | dBm | -45.5 | -45.5 | -45.5 | -45.5 |
| PInterferer | dBm | -25 |
| BWInterferer  | MHz | 50 | 100 | 200 | 400 |
| FInterferer (offset) | MHz | 50/-50NOTE 2 |  100/-100NOTE 2 | 200/-200NOTE 2 | 400/-400NOTE 2 |
| NOTE 1: The interferer consists of the Reference measurement channel specified in Annex 3.2 with one sided dynamic OCNG Pattern TDD as described in Annex A and set-up according to Annex C.NOTE 2: The absolute value of the interferer offset FInterferer (offset) shall be further adjusted to (CEIL(|FInterferer|/SCS) + 0.5)\*SCS MHz with SCS the sub-carrier spacing of the wanted signal in MHz. Wanted and interferer signal have same SCS. |

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## 7.5A Adjacent channel selectivity for CA

For intra-band contiguous carrier aggregation, the SCC(s) shall be configured at nominal channel spacing to the PCC. The UE shall fulfil the minimum requirement specified in Table 7.5.1A-1 for an adjacent channel interferer on either side of the aggregated downlink signal at a specified frequency offset and for an interferer power up to -25 dBm.

The throughput of each carrier shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annexes A.2.3.2 and A.3.3.2 (with one sided dynamic OCNG Pattern OP.1 TDD for the DL-signal as described in Annex A.5.2.1). The requirement is verified with the test metric of EIS (Link=RX beam peak direction, Meas=Link angle).

Table 7.5A-1: Adjacent channel selectivity for CA

|  |  |  |
| --- | --- | --- |
| Operating band |  Units | Adjacent channel selectivity / CA bandwidth class |
| All CA bandwidth class |
| n257, n258, n261 | dB | 23 |
| n259, n260 | dB | 22 |

Table 7.5A-2: Adjacent channel selectivity test parameters for CA, Case 1

|  |  |  |
| --- | --- | --- |
| Rx Parameter | Units  | All CA bandwidth Classes |
| Pw in Transmission Bandwidth Configuration, per CC |   | REFSENS + 14 dB |
| PInterferer for band n257, n258, n261 | dBm | Aggregated power + 21.5 |
| PInterferer for band n260 | dBm | Aggregated power + 20.5  |
| BWInterferer  | MHz | BWChannel\_CA |
| FInterferer (offset) | MHz | + BWchannel CA/- BWchannel CANOTE 3 |
|
|
| NOTE 1: The interferer consists of the Reference measurement channel specified in Annex 3.2 with one sided dynamic OCNG Pattern as described in Annex A and set-up according to Annex C.NOTE 2: The Finterferer (offset) is the frequency separation between the center of the aggregated CA bandwidth and the center frequency of the Interferer signalNOTE 3: The absolute value of the interferer offset FInterferer (offset) shall be further adjusted to (CEIL(|FInterferer|/SCS) + 0.5)\*SCS MHz with SCS the sub-carrier spacing of the carrier closest to the interferer in MHz. The interfering signal has the same SCS as that of the closest carrier. |

Table 7.5A-3: Adjacent channel selectivity test parameters for CA, Case 2

|  |  |  |
| --- | --- | --- |
| Rx Parameter | Units  | All CA bandwidth classes |
| Pw in Transmission Bandwidth Configuration, aggregated power for band n257, n258, n261 | dBm | - 46.5 |
| Pw in Transmission Bandwidth Configuration, aggregated power for band n260 | dBm | - 45.5 |
| Pinterferer  | dBm | - 25  |
| BWInterferer  | MHz | BWChannel\_CA |
| FInterferer (offset) | MHz | + BWchannel CA/- BWchannel CANOTE 3 |
|
|
| NOTE 1: The interferer consists of the Reference measurement channel specified in Annex A.3.3.2 with one sided dynamic OCNG Pattern OP.1 TDD as described in Annex A.5.2.1 and set-up according to Annex C.NOTE 2: The Finterferer (offset) is the frequency separation between the center of the aggregated CA bandwidth and the center frequency of the Interferer signalNOTE 3: The absolute value of the interferer offset FInterferer (offset) shall be further adjusted to (CEIL(|FInterferer|/SCS) + 0.5)\*SCS MHz with SCS the sub-carrier spacing of the carrier closest to the interferer in MHz. The interfering signal has the same SCS as that of the closest carrier. |

For intra-band non-contiguous carrier aggregation with two component carriers, two different requirements apply for out-of-gap and in-gap. For out-of-gap, the UE shall meet the requirements for each component carrier as specified in clauses 7.5. For in-gap, the requirement applies if the following minimum gap condition is met:

∆*fACS*$∆f\_{ACS}$ ≥ BW1/2 + BW2/2 + max(BW1, BW2),

where ∆*fACS* $∆f\_{ACS}$ is the frequency separation between the center frequencies of the component carriers and BW*k*/2 are the channel bandwidths of carrier *k*, *k* = 1,2.

If the minimum gap condition is met, the UE shall meet the requirements specified in clauses 7.5 for each component carrier considered. The respective channel bandwidth of the component carrier under test will be used in the parameter calculations of the requirement. In case of more than two component carriers, the minimum gap condition is computed for any pair of adjacent component carriers following the same approach as the two component carriers. The in-gap requirement for the corresponding pairs shall apply if the minimum gap condition is met.

For every component carrier to which the requirements apply, the UE shall meet the requirement with one active interferer signal (in-gap or out-of-gap) while all downlink carriers are active.

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### 7.6.2 In-band blocking

In-band blocking is a measure of a receiver's ability to receive a NR signal at its assigned channel frequency in the presence of an interferer at a given frequency offset from the centre frequency of the assigned channel.

The throughput shall be ≥ 95 % of the maximum throughput of the reference measurement channels as specified in Annexes A.2.3.2 and A.3.3.2 (with one sided dynamic OCNG Pattern OP.1 TDD for the DL-signal as described in Annex A.5.2.1). The requirement is verified with the test metric of EIS (Link=RX beam peak direction, Meas=Link angle).

Table 7.6.2-1: In band blocking requirements

|  |  |  |
| --- | --- | --- |
| Rx parameter | Units  | Channel bandwidth |
| 50 MHz  | 100 MHz | 200 MHz | 400 MHz |
| Power in Transmission Bandwidth Configuration | dBm | REFSENS + 14 dB |
| BWInterferer | MHz | 50 | 100 | 200 | 400 |
| PInterfererfor bands n257, n258, n261 | dBm | REFSENS + 35.5 dB | REFSENS + 35.5 dB | REFSENS + 35.5 dB | REFSENS + 35.5 dB |
| PInterfererfor band n259, n260 | dBm | REFSENS + 34.5 dB | REFSENS + 34.5 dB | REFSENS + 34.5 dB | REFSENS + 34.5 dB |
| FIoffset | MHz | ≤ -100 & ≥ 100NOTE 5 | ≤ -200 & ≥ 200NOTE 5 | ≤ -400 & ≥ 400NOTE 5 | ≤ -800 & ≥ 800NOTE 5 |
| FInterferer | MHz | FDL\_low + 25to FDL\_high - 25 | FDL\_low + 50to FDL\_high - 50 | FDL\_low + 100to FDL\_high - 100 | FDL\_low + 200to FDL\_high - 200 |
| NOTE 1: The interferer consists of the Reference measurement channel specified in Annex A.3.3.2 with one sided dynamic OCNG Pattern OP.1. TDD as described in Annex A.5.2.1 and set-up according to Annex C.NOTE2: The REFSENS power level is specified in Clause 7.3.2, which are applicable according to different UE power classes.NOTE 3: The wanted signal consists of the reference measurement channel specified in Annex A.3.3.2 with one sided dynamic OCNG pattern OP.1 TDD as described in Annex A.5.2.1 and set-up according to Annex C.NOTE 4: FIoffset is the frequency separation between the center of the channel bandwidth and the center frequency of the Interferer signal.NOTE 5: The absolute value of the interferer offset FIoffset shall be further adjusted (CEIL(|FInterferer|/SCS) + 0.5)\*SCS MHz with SCS the sub-carrier spacing of the wanted signal in MHz. Wanted and interferer signal have same SCS.NOTE 6: FInterferer range values for unwanted modulated interfering signals are interferer center frequencies. |

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### 7.6A.2 In-band blocking

For intra-band contiguous carrier aggregation, the SCC(s) shall be configured at nominal channel spacing to the PCC. The UE shall fulfil the minimum requirement specified in Table 7.6A.2-1 for in the presence of an interferer at a given frequency offset from the centre frequency of the assigned channel and an interferer power shall not exceed -25 dBm. The throughput of each carrier shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annexes A.2.3.2 and A.3.3.2 (with one sided dynamic OCNG Pattern OP.1 TDD for the DL-signal as described in Annex A.5.2.1). The requirement is verified with the test metric of EIS (Link=RX beam peak direction, Meas=Link angle).

Table 7.6A.2-1: In band blocking minimum requirements for intra-band contiguous CA

|  |  |  |
| --- | --- | --- |
| Rx Parameter | Units  | All CA bandwidth classes |
| Power in Transmission Bandwidth Configuration, per CC |   | REFSENS + 14 dB |
| Pinterferer for band n257, n258, n261 | dBm | Aggregated power + 21.5 |
| Pinterferer for band n259, n260 | dBm | Aggregated power + 20.5  |
| BWInterferer  | MHz | BWChannel\_CA |
| FIoffset | MHz | +2\*BWChannel\_CA / -2\*BWChannel\_CANOTE 5 |
| FInterferer  | MHz | FDL\_low + 0.5\*BWChannel\_CAToFDL\_high - 0.5\*BWChannel\_CA |
|
|
| NOTE 1: The interferer consists of the Reference measurement channel specified in Annex A.3.3.2 with one sided dynamic OCNG Pattern OP.1 TDD as described in Annex A.5.2.1. and set-up according to Annex C.NOTE 2: The REFSENS power level is specified in Table 7.3.2-1.NOTE 3: The wanted signal consists of the reference measurement channel specified in Annex A.3.3.2 QPSK, R=1/3 with one sided dynamic OCNG pattern OP.1 TDD as described in Annex A.5.2.1 and set-up according to Annex C.NOTE 4: The FInterferer (offset) is the frequency separation between the center of the aggregated CA bandwidth and the center frequency of the Interferer signal.NOTE 5: The absolute value of the interferer offset FInterferer (offset) shall be further adjusted to (CEIL(|FInterferer|/SCS) + 0.5)\*SCS MHz with SCS the sub-carrier spacing of the carrier closest to the interferer in MHz. The interfering signal has the same SCS as that of the closest carrier.NOTE 6: FInterferer range values for unwanted modulated interfering signals are interferer center frequencies. |

For intra-band non-contiguous carrier aggregation with two component carriers, the requirement applies to out-of-gap and in-gap. For out-of-gap, the UE shall meet the requirements for each component carrier with parameters as specified in 7.6.2-1. The requirement associated to the maximum channel between across the component carriers is selected. For in-gap, the requirement shall apply if the following minimum gap condition is met:

∆*fIBB* ≥ 0.5(BW1 + BW2) + 2 max(BW1, BW2),

where ∆*fIBB* is the frequency separation between the center frequencies of the component carriers and BW*k*/2 are the channel bandwidths of carrier *k*, *k* = 1,2.

If the minimum gap condition is met, the UE shall meet the requirement specified in Table 7.6.2-1 for each component carrier. The respective channel bandwidth of the component carrier under test will be used in the parameter calculations of the requirement. In case of more than two component carriers, the minimum gap condition is computed for any pair of adjacent component carriers following the same approach as the two component carriers. The in-gap requirement for the corresponding pairs shall apply if the minimum gap condition is met. For every component carrier to which the requirements apply, the UE shall meet the requirement with one active interferer signal (in-gap or out-of-gap) while all downlink carriers are active.

Table 7.6A.2-2: (Void)

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