**3GPP TSG-RAN4 Meeting #109 *R4-2321639***

**Chicago, US, 13th – 17th November, 2023**

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| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| *CR-Form-v12.2* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
|  | | | | | | | | |
|  | **38.133** | **CR** | **xxxx** | **rev** | **-** | **Current version:** | **18.3.0** |  |
|  | | | | | | | | |
| *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 |  | Radio Access Network |  | Core Network |  |

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|  | | | | | | | | | | |
| ***Title:*** | Big CR to TS 38.133 on intra-band non-collocated EN-DC/NR-CA deployment | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** | Huawei, HiSilicon | | | | | | | | | |
| ***Source to TSG:*** | R4 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | NonCol\_intraB\_ENDC\_NR\_CA-Core | | | | |  | ***Date:*** | | | 2023-11-21 |
|  |  | | | |  | |  | | |  |
| ***Category:*** | B |  | | | | | ***Release:*** | | | Rel-18 |
|  | *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 can be 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-16 (Release 16) Rel-17 (Release 17) Rel-18 (Release 18)  Rel-19 (Release 19)* | |
|  |  | | | | | | | | | |
| ***Reason for change:*** | | Big CR to merge the multiple endorsed draft CRs in RAN4#109 meeting for RRM requirements for support of intra-band non-collocated EN-DC/NR-CA deployment. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | | The summary of change in each endorsed draft CRs are copied below.   * R4-2321417 CR on RRM core requirement for NonCol\_intraB   + Clarify the requirement with regard to [nonCollocatedTypeNR-CA-r18]. * R4-2321416 DraftCR on updating Type 1/2 applicability conditions for inter-band EN-DC with overlapping DL bands R18   + To update update Type 1/2 applicability conditions for RRM requiremnts for inter-band EN-DC with overlapping DL bands. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Consequences if not approved:*** | | * R4-2321417 CR on RRM core requirement for NonCol\_intraB   + RRM requirement for intra-band non-collocated CA is unclear. * R4-2321416 DraftCR on updating Type 1/2 applicability conditions for inter-band EN-DC with overlapping DL bands R18   + The impacts of new BS signalling cannot be reflected in RRM requirements for inter-band EN-DC with overlapping DL bands. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | 7.5.2, 7.5.4, 7.6.2, 7.6.4, 8.1.7.2, 8.2.1.2.3, 8.2.1.2.4, 8.2.1.2.5.2, 8.2.1.2.5.3, 8.2.1.2.5.4, 8.2.1.2.8.1, 8.2.1.2.9, 8.2.2.2.1, 8.2.2.2.2, 8.2.2.2.3,  8.3.2, 8.5.2, 8.5.3, 8.5.5, 8.5.6, 8.5.7.2, 8.5.8.2, 9.2.5.3, 9.3.9.3, 9.3.10.3, 9.5.6.2, 9.7.4.1, 9.8.6.2, 9.10.2.6, 9.13.6 | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **Y** | **N** |  | | | |  | | |
| ***Other specs*** | |  | **X** | Other core specifications | | | | TS/TR ... CR ... | | |
| ***affected:*** | | **X** |  | Test specifications | | | | TS38.533 | | |
| ***(show related CRs)*** | |  | **X** | O&M Specifications | | | | TS/TR ... CR ... | | |
|  | |  | | | | | | | | |
| ***Other comments:*** | |  | | | | | | | | |
|  | |  | | | | | | | | |
| ***This CR's revision history:*** | |  | | | | | | | | |

### <Start of Changes>

### 7.5.2 Minimum Requirements for inter-band EN-DC

The UE shall be capable of handling a maximum uplink transmission timing difference between E-UTRA PCell and PSCell as shown in Table 7.5.2-1.

Table 7.5.2-1 Maximum uplink transmission timing difference requirement for asynchronous EN-DC

|  |  |  |
| --- | --- | --- |
| Sub-carrier spacing in E-UTRA PCell (kHz) | UL Sub-carrier spacing for data in PSCell (kHz) | Maximum uplink transmission timing difference (µs) |
| 15 | 15 | 500 |
| 15 | 30 | 250 |
| 15 | 60 | 125 |
| 15 | 120Note1 | 62.5 |
| NOTE 1: For E-UTRA FDD-NR FDD intra-band EN-DC, for which the requirement is defined in clause 7.5.3 and this Table 7.5.2-1 is also applicable, the scenario with 120kHz PSCell does not exist. | | |

Table 7.5.2-2 Void

#### 7.5.2.1 Minimum Requirements for inter-band synchronous EN-DC

The requirements in this clause apply as a reference for inter-band synchronous EN-DC.

The UE shall be capable of handling a maximum uplink transmission timing difference between E-UTRA PCell and PSCell for inter-band synchronous EN-DC as shown in Table 7.5.2.1-1 1. The requirements for synchronous EN-DC are applicable for E-UTRA TDD-NR TDD, E-UTRA FDD-NR FDD, E-UTRA TDD-NR FDD and E-UTRA FDD-NR TDD inter-band EN-DC.

For E-UTRA TDD-NR TDD inter-band EN-DC with overlapping or partially overlapping DL bands, only synchronized operation is assumed. The UE shall be capable of handling a maximum uplink transmission timing difference between E-UTRA PCell and PSCell as shown in Table 7.5.2.1-1 provided that UE not supporting [*requirementTypeIndication-r18*] indicates that it is capable of *interBandMRDC-WithOverlapDL-Bands-r16* or UE supporting [*requirementTypeIndication-r18*] is capable of *interBandMRDC-WithOverlapDL-Bands-r16* and not provided with [*nonCollocatedTypeMRDC-r18*], and in Table 7.5.3-1 provided that UE indicates that it is not capable of *interBandMRDC-WithOverlapDL-Bands-r16* or UE supporting [*requirementTypeIndication-r18*] is capable of *interBandMRDC-WithOverlapDL-Bands-r16* and provided with [*nonCollocatedTypeMRDC-r18*].

Table 7.5.2.1-1 Maximum uplink transmission timing difference requirement for inter-band synchronous EN-DC

|  |  |  |
| --- | --- | --- |
| Sub-carrier spacing in E-UTRA PCell (kHz) | UL Sub-carrier spacing for data in PSCell (kHz) | Maximum uplink transmission timing difference (µs) |
| 15 | 15 | 35.21 |
| 15 | 30 | 35.21 |
| 15 | 60 | 35.21 |
| 15 | 120 | 35.21 |

### <Unchanged Text Skipped>

### 7.5.4 Minimum Requirements for NR Carrier Aggregation

The UE shall be capable of handling at least a relative transmission timing difference between slot timing of all pairs of TAGs in FR1 and/or FR2-1 as shown in Table 7.5.4-1, provided that the UE is:

- configured with the pTAG and the sTAG for inter-band NR carrier aggregation in SA or NR-DC mode, or

- configured with more than one sTAG for inter-band NR carrier aggregation in EN-DC or NE-DC mode.

The UE shall be capable of handling at least a relative transmission timing difference between subframe timing of all pairs of TAGs between FR1 and FR2-2 as shown in Table 7.5.4-1, provided that the UE is:

- configured with the pTAG and the sTAG for inter-band NR carrier aggregation in SA or NR-DC mode.

For FR1 intra-band non-contiguous NR carrier aggregation, the UE shall be capable of handling at least a relative transmission timing difference as shown in Table 7.5.4-1, between slot timing of all FR1 pairs of TAGs provided that UE indicates that it is capable of [*intraBandNRCA-NonCollocated-r18*] and [*nonCollocatedTypeNR-CA-r18*] is not provided.

Table 7.5.4-1: Maximum uplink transmission timing difference requirement for inter-band NR carrier aggregation

|  |  |
| --- | --- |
| Frequency Range of the pair of TAGs | Maximum uplink transmission timing difference (µs) |
| FR1 | 34.6 |
| FR2-1 | 8.5 Note1 |
| Between FR1 and FR2-1 | 26.1 |
| Between FR1 and FR2-2 | 26.1 |
| Note1: This requirement applies to the UE capable of independent beam management for FR2-1 inter-band CA. | |

### <Unchanged Text Skipped>

### 7.6.2 Minimum Requirements for inter-band EN-DC

The UE shall be capable of handling at least a relative receive timing difference between subframe timing of signal from a E-UTRA cell belonging to the MCG and slot timing of signal from a cell belonging to SCG at the UE receiver as shown in Table 7.6.2-1.

Table 7.6.2-1: Maximum receive timing difference requirement for asynchronous EN-DC

|  |  |  |
| --- | --- | --- |
| Sub-carrier spacing of E-UTRA cell in MCG (kHz) | DL Sub-carrier spacing of cell in SCG (kHz) (Note 1) | Maximum receive timing difference (µs) |
| 15 | 15 | 500 |
| 15 | 30 | 250 |
| 15 | 60 | 125 |
| 15 | 120Note2 | 62.5 |
| NOTE 1: DL Sub-carrier spacing is min{SCSSS, SCSDATA}.  NOTE 2: For E-UTRA FDD-NR FDD intra-band EN-DC, for which the requirement is defined in clause 7.6.3 and this Table 7.6.2-1 is also applicable, the scenario with 120 kHz does not exit. | | |

Table 7.6.2-2 Void

Table 7.6.2-3 Void

#### 7.6.2.1 Minimum Requirements for inter-band synchronous EN-DC

The requirements in this clause apply as a reference for inter-band synchronous EN-DC.

The UE shall be capable of handling at least a relative receive timing difference between subframe timing of signal from an E-UTRA cell belonging to the MCG and slot timing of signal from a cell belonging to SCG at the UE receiver for inter-band synchronous EN-DC as shown in Table 7.6.2.1-1. The requirements for synchronous EN-DC are applicable for E-UTRA TDD-NR TDD, E-UTRA FDD-NR FDD, E-UTRA TDD-NR FDD and E-UTRA FDD-NR TDD inter-band EN-DC.

For E-UTRA TDD-NR TDD inter-band EN-DC with overlapping or partially overlapping DL bands, only synchronized operation is assumed. The UE shall be capable of handling at least a relative receive timing difference between subframe timing of signal from a E-UTRA cell belonging to the MCG and slot timing of signal from a cell belonging to the SCG at the UE receiver as shown in Table 7.6.2.1-1 provided that UE not supporting [*requirementTypeIndication-r18*] indicates that it is capable of *interBandMRDC-WithOverlapDL-Bands-r16* or UE supporting [*requirementTypeIndication-r18*] is capable of *interBandMRDC-WithOverlapDL-Bands-r16* and not provided with [*nonCollocatedTypeMRDC-r18*], and in Table 7.6.3-1 provided that UE is not capable of *interBandMRDC-WithOverlapDL-Bands-r16* or UE supporting [*requirementTypeIndication-r18*] is capable of *interBandMRDC-WithOverlapDL-Bands-r16* and provided with [*nonCollocatedTypeMRDC-r18*].

Table 7.6.2.1-1: Maximum receive timing difference requirement for inter-band synchronous EN-DC

|  |  |  |
| --- | --- | --- |
| Sub-carrier spacing of E-UTRA cell in MCG (kHz) | DL Sub-carrier spacing of cell in SCG (kHz) (Note1) | Maximum receive timing difference (µs) |
| 15 | 15 | 33 |
| 15 | 30 |  |
| 15 | 60 |  |
| 15 | 120 |  |
| Note 1: DL Sub-carrier spacing is min{SCSSS, SCSDATA}. | | |

### <Unchanged Text Skipped>

### 7.6.4 Minimum Requirements for NR Carrier Aggregation

For intra-band contiguous CA, only co-located deployment is applied. For intra-band non-contiguous NR carrier aggregation, the UE not capable of [*intraBandNRCA-NonCollocated-r18*] shall be capable of handling at least a relative receive timing difference between slot timing of different carriers to be aggregated at the UE receiver as shown in Table 7.6.4-1 below.

For FR1 intra-band non-contiguous NR carrier aggregation, the UE shall be capable of handling at least a relative receive timing difference as shown in 7.6.4-2, between slot timing of different FR1 carriers to be aggregated at the UE receiver provided that UE indicates that it is capable of [*intraBandNRCA-NonCollocated-r18*] and [*nonCollocatedTypeNR-CA-r18*] is not provided. Otherwise, the UE shall be capable of handling at least a relative receive timing difference between slot timing of different carriers to be aggregated at the UE receiver as shown in Table 7.6.4-1 below if*[nonCollocatedTypeNR-CA-r18]* is provided.

Table 7.6.4-1: Maximum receive timing difference requirement for intra-band non-contiguous NR carrier aggregation

|  |  |
| --- | --- |
| Frequency Range | Maximum receive timing difference (µs) |
| FR1 | 31 |
| FR2-1 | 0.26 |
| Note 1: In the case of different SCS on different CCs, if the receive time difference exceeds the cyclic prefix length of that SCS, demodulation performance degradation is expected for the first symbol of the slot. | |

For inter-band NR carrier aggregation,

- the UE shall be capable of handling at least a relative receive timing difference between slot timing of all pairs of carriers in FR1 and FR2-1 to be aggregated at the UE receiver as shown in Table 7.6.4-2 below.

- the UE shall be capable of handling at least a relative receive timing difference between subframe timing of all pairs of carriers in FR1 and FR2-2 to be aggregated at the UE receiver as shown in Table 7.6.4-2 below.

Table 7.6.4-2: Maximum receive timing difference requirement for inter-band NR carrier aggregation

|  |  |
| --- | --- |
| Frequency Range of the pair of carriers | Maximum receive timing difference (µs) |
| FR1 | 33 |
| FR2-1 | 8 note1 |
| Between FR1 and FR2-1 | 25 |
| Between FR1 and FR2-2 | 25 |
| Note1: This requirement applies to the UE capable of independent beam management for FR2-1 inter-band CA. | |

### <Unchanged Text Skipped>

#### 8.1.7.2 Scheduling availability of UE performing radio link monitoring with a different subcarrier spacing than PDSCH/PDCCH on FR1

For UEs which support *simultaneousRxDataSSB-DiffNumerology* [14] there are no restrictions on scheduling availability due to radio link monitoring based on SSB as RLM-RS. For UEs which do not support *simultaneousRxDataSSB-DiffNumerology* [14] the following restrictions apply due to radio link monitoring based on SSB as RLM -RS.

- The UE is not expected to transmit PUCCH, PUSCH or SRS or receive PDCCH, PDSCH or CSI-RS for tracking or CSI-RS for CQI on SSB symbols to be measured for radio link monitoring.

When intra-band carrier aggregation in FR1 is performed, the scheduling restrictions on FR1 serving PCell or PSCell applies to all serving cells in the same band on the symbols that fully or partially overlap with the restricted symbols.

When intra-band non-contiguous carrier aggregation is configured for a UE indicating *[intraBandNR-CA-non-collocated-r18*], there are no scheduling restrictions on FR1 serving cell(s) configured on the non-contiguous CC(s) in the same band if [*nonCollocatedTypeNR-CA-r18*] is not provided. Otherwise, the scheduling restrictions on FR1 serving PCell or PSCell applies to all serving cells in the same band on the symbols that fully or partially overlap with the restricted symbols if*[nonCollocatedTypeNR-CA-r18]* is provided.

When inter-band carrier aggregation within FR1 is performed, there are no scheduling restrictions on FR1 serving cell(s) in the bands due to radio link monitoring performed on FR1 serving PCell or PSCell in different bands.

### <Unchanged Text Skipped>

##### 8.2.1.2.3 Interruptions at SCell addition/release

The requirements in this clause shall apply for the UE configured with PSCell.

When one E-UTRA SCell in MCG is added or released:

- the UE is allowed an interruption on any active serving cell in SCG:

- of up to X1 slot, if the active serving cell is not in the same band as any of the E-UTRA SCells being added or released, or

- of up to X1 slot, if the active serving cell is in the band overlapping or partially overlapping with the E-UTRA SCell being added or released and UE not supporting [*requirementTypeIndication-r18*] indicates it is capable of *interBandMRDC-WithOverlapDL-Bands-r16* on this band pair or UE supporting [*requirementTypeIndication-r18*] is capable of *interBandMRDC-WithOverlapDL-Bands-r16* on this band pairand is not provided with [*nonCollocatedTypeMRDC-r18*], or

- of up to max{Y1 slot + TSMTC\_duration, 5ms}, if the active serving cells are in the same band or in the band overlapping or partially overlapping with the E-UTRA SCells being added or released, and UE does not indicates it is capable of *interBandMRDC-WithOverlapDL-Bands-r16* on this band pair or UE capable of [*requirementTypeIndication-r18*] indicates that it is capable of *interBandMRDC-WithOverlapDL-Bands-r16* on this band pairand provided with [*nonCollocatedTypeMRDC-r18*], provided the cell specific reference signals from the active serving cells and the E-UTRA SCells being added or released are available in the same slot, where TSMTC\_duration is the longest SMTC duration among all above active serving cells in SCG;

Where X1 and Y1 are specified in Table 8.2.1.2.3-1.

When one SCell in SCG is added or released:

- the UE is allowed an interruption on any active serving cell in SCG:

- of up to X1 slot, if the active serving cell and the SCell being added or released are in a FR1 band pair or in a FR1+FR2 band pair.

- of up to X1 slot, if the active serving cell and the SCell being added or released are in a FR2 band pair and UE is capable of independent beam management on this FR2 band pair

- of up to X1 slot, if the active serving cell is non-contiguous to the SCell being added or released in the same FR1 band and UE is capable of [*intraBandNRCA-NonCollocated-r18*] and [*nonCollocatedTypeNR-CA-r18*] is not provided.

or

- of up to Y1 slot + TSMTC\_duration, if the active serving cells are contiguous to any of the SCells being added or released in the same FR1 band, or if the active serving cells are in the same FR1 band as any of the SCells being added or released and UE is not capable of [*intraBandNRCA-NonCollocated-r18*] or UE is capable of [*intraBandNRCA-NonCollocated-r18*] and [*nonCollocatedTypeNR-CA-r18*] is provided, provided the cell specific reference signals from the active serving cells and the SCells being added or released are available in the same slot, where, TSMTC\_duration is

- the longest SMTC duration among all above active serving cells in SCG and the SCell being added when one SCell is added. If SSB configuration (*absoluteFrequencySSB*) but no SMTC configuration is provided for the SCell being added, the SSB transmission periodicity is assumed to be 5ms and TSMTC duration for the SCell being added is x ms, where x = the number of consecutive subframes containing all SSBs in one SSB burst transmitted by the SCell being added. If no SSB configuration (*absoluteFrequencySSB*) nor SMTC configuration is provided for the SCell being added, TSMTC duration for the SCell being added is 0 ms;

- the longest SMTC duration among all above active serving cells in SCG when one SCell is released.

- of up to Y1 slot + TSMTC\_duration if the active serving cells are in the same FR2 band as any of the SCells being added or released, provided the cell specific reference signals from the active serving cells and the SCells being added or released are available in the same slot, where, TSMTC\_duration is

- the longest SMTC duration among all above active serving cells in SCG and the SCell being added when one SCell is added. If SSB configuration (*absoluteFrequencySSB*) but no SMTC configuration is provided for the SCell being added, the SSB transmission periodicity is assumed to be 5ms and TSMTC duration for the SCell being added is x ms, where x = the number of consecutive subframes containing all SSBs in one SSB burst transmitted by the SCell being added. If no SSB configuration (*absoluteFrequencySSB*) nor SMTC configuration is provided for the SCell being added, TSMTC duration for the SCell being added is 0 ms;

- the longest SMTC duration among all above active serving cells in SCG when one SCell is released.

Where X1 and Y1 are specified in Table 8.2.1.2.3-2.

Table 8.2.1.2.3-1: Interruption length X1 and Y1 at E-UTRA SCell addition/Release

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | NR Slot length | Interruption length X1 (slots) | | Interruption length Y1 (slots) | |
|  | (ms) | Sync | Async | Sync | Async |
| 0 | 1 | 1 | 2 | 1 | 2 |
| 1 | 0.5 | 2 | 3 | 2 | 3 |
| 2 | 0.25 | 5 | | 4 | 5 |
| 3 | 0.125 | 9 | | N/A | - N/A |

Table 8.2.1.2.3-2: Interruption length X1 and Y1 at SCell addition/Release

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | NR Slot length (ms) of victim cell | Interruption length X1 (slots) | | Interruption length Y1 (slots) |
| 0 | 1 | 1 | | 1 |
| 1 | 0.5 | 2 | | 2 |
| 2 | 0.25 | Both aggressor cell and victim cell are on FR2 | 4 | 4 |
|  |  | Either aggressor cell or victim cell is on FR1 | 5 |  |
| 3 | 0.125 | Aggressor cell is on FR2 | 8 | 8 |
|  |  | Aggressor cell is on FR1 | 9 |  |

##### 8.2.1.2.4 Interruptions at SCell activation/deactivation

The requirements in this clause shall apply for the UE configured with PSCell and one SCell.

When one E-UTRA SCell in MCG is activated from deactivated or dormant state, or deactivated from activated or dormant state:

- the UE is allowed an interruption on any active serving cell in SCG:

- of up to X2 slot, if the active serving cell is not in the same band as any of the E-UTRA SCells being activated or deactivated, or

- of up to X2 slot, if the active serving cell is in the band overlapping or partially overlapping with the E-UTRA SCell being activated or deactivated and UE not supporting [*requirementTypeIndication-r18*] indicates it is capable of *interBandMRDC-WithOverlapDL-Bands-r16* on this band pair or UE supporting [*requirementTypeIndication-r18*] indicates that it is capable of *interBandMRDC-WithOverlapDL-Bands-r16* on this band pairand not provided with [*nonCollocatedTypeMRDC-r18*], or

- of up to max{Y2 slot + TSMTC\_duration, 5ms}, if the active serving cells are in the same band or in the band overlapping or partially overlapping with the E-UTRA SCells being activated or deactivated, and UE does not indicate it is capable of *interBandMRDC-WithOverlapDL-Bands-r16* on this band pair or UE supporting [*requirementTypeIndication-r18*] indicates that it is capable of *interBandMRDC-WithOverlapDL-Bands-r16* on this band pairand is provided with [*nonCollocatedTypeMRDC-r18*], provided the cell specific reference signals from the active serving cells and the E-UTRA SCells being activated or deactivated are available in the same slot, where TSMTC\_duration is the longest SMTC duration among all above active serving cells in SCG.

Where X2 and Y2 are specified in Table 8.2.1.2.4-1.

When one SCell in SCG is activated or deactivated:

- an interruption on any active serving cell in SCG:

- of up to X2 slot, if the active serving cell and the SCell being activated or deactivated are in a FR1 band pair or in a FR1+FR2 band pair.

- of up to X2 slot, if the active serving cells and the SCells being activated or deactivated are in a FR2 band pair and UE is capable of independent beam management on this FR2 band pair.

- of up to X1 slot, if the active serving cell is non-contiguous to the SCell being activated or deactivated in the same FR1 band and UE is capable of [*intraBandNRCA-NonCollocated-r18*] and [*nonCollocatedTypeNR-CA-r18*] is not provided.

or

- of up to Y1 slot + TSMTC\_duration, if the active serving cells are contiguous to any of the SCells being activated or deactivated in the same FR1 band, or if the active serving cells are in the same FR1 band as any of the SCells being activated or deactivated and UE is not capable of [*intraBandNRCA-NonCollocated-r18*] or UE is capable of [*intraBandNRCA-NonCollocated-r18*] and [*nonCollocatedTypeNR-CA-r18*] is provided, provided the cell specific reference signals from the active serving cells and the SCells being activated or deactivated are available in the same slot, where, TSMTC\_duration is

- the longest SMTC duration among all above active serving cells in SCG and the SCell being activated when one SCell is activated. If SSB configuration (*absoluteFrequencySSB*) but no SMTC configuration is provided for the SCell being activated, the SSB transmission periodicity is assumed to be 5ms and TSMTC duration for the SCell being activated is x ms, where x = the number of consecutive subframes containing all SSBs in one SSB burst transmitted by the SCell being activated. If no SSB configuration (*absoluteFrequencySSB*) nor SMTC configuration is provided for the SCell being activated, TSMTC duration for the SCell being activated is 0ms;

- the longest SMTC duration among all above active serving cells in SCG when one SCell is deactivated.

- of up to Y2 slot + TSMTC\_duration if the active serving cells are in the same FR2 band as any of the SCells being activated or deactivated, provided the cell specific reference signals from the active serving cells and the SCells being activated or deactivated are available in the same slot, where, TSMTC\_duration is

- the longest SMTC duration among all above active serving cells in SCG and the SCell being activated when one SCell is activated. If SSB configuration (*absoluteFrequencySSB*) but no SMTC configuration is provided for the SCell being activated, the SSB transmission periodicity is assumed to be 5ms and TSMTC duration for the SCell being activated is x ms, where x = the number of consecutive subframes containing all SSBs in one SSB burst transmitted by the SCell being activated. If no SSB configuration (*absoluteFrequencySSB*) nor SMTC configuration is provided for the SCell being activated, TSMTC duration for the SCell being activated is 0ms;

- the longest SMTC duration among all above active serving cells in SCG when one SCell is deactivated.

Where X2 and Y2 are specified in Table 8.2.1.2.4-2.

Table 8.2.1.2.4-1: Interruption length X2 and Y2 at E-UTRA SCell activation/deactivation

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | NR Slot length | nterruption length X2 (slots) | | Interruption length Y2 (slots) | |
|  | (ms) | Sync | Async | Sync | Async |
| 0 | 1 | 1 | 2 | 1 | 2 |
| 1 | 0.5 | 1 | 2 | 1 | 2 |
| 2 | 0.25 | 3 | | 2 | 3 |
| 3 | 0.125 | 5 | | N/A | N/A |

Table 8.2.1.2.4-2: Interruption length X2 and Y2 at SCell activation/deactivation

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | NR Slot length (ms) of victim cell | Interruption length X2 (slots) | | Interruption length Y2 (slots) |
| 0 | 1 | 1 | | 1 |
| 1 | 0.5 | 1 | | 1 |
| 2 | 0.25 | Both aggressor cell and victim cell are on FR2 | 2 | 2 |
|  |  | Either aggressor cell or victim cell is on FR1 | 3 |  |
| 3 | 0.125 | Aggressor cell is on FR2 | 4 | 4 |
|  |  | Aggressor cell is on FR1 | 5 |  |

### <Unchanged Text Skipped>

###### 8.2.1.2.5.2 Interruptions during measurements on deactivated E-UTRAN SCC

When one E-UTRA SCell in MCG is deactivated, the UE is allowed due to measurements on the E-UTRA SCC with the deactivated E-UTRA SCell:

- an interruption on PSCell or any activated SCell with up to 0.5% probability of missed ACK/NACK when any of the configured *measCycleSCell* [15] for the deactivated E-UTRA SCellsis 640 ms or longer.

- an interruption on PSCell or any activated SCell with up to 0.5% probability of missed ACK/NACK regardless of the configured *measCycleSCell* [15]for the deactivated E-UTRA SCells if indicated by the network using IE *allowInterruptions* [15].

Each interruption shall not exceed

- X3 slot, if the PSCell or activated SCell is not in the same band as the E-UTRA deactivated SCC being measured, or

- X3 slot, if the PSCell or activated SCell is in the band overlapping or partially overlapping with the E-UTRA deactivated SCC being measured, and UE not supporting [*requirementTypeIndication-r18*] indicates it is capable of *interBandMRDC-WithOverlapDL-Bands-r16* on this band pair or UE supporting [*requirementTypeIndication-r18*] indicates that it is capable of *interBandMRDC-WithOverlapDL-Bands-r16* on this band pairand is not provided with [*nonCollocatedTypeMRDC-r18*], or

- Y3 slot + SMTC duration, if the PSCell or activated SCell is in the same band or in the band overlapping or partially overlapping with the E-UTRA deactivated SCC being measured, and UE does not indicate it is capable of *interBandMRDC-WithOverlapDL-Bands-r16* on this band pair or UE supporting [*requirementTypeIndication-r18*] indicates that it is capable of *interBandMRDC-WithOverlapDL-Bands-r16* on this band pairand is provided with [*nonCollocatedTypeMRDC-r18*], provided the cell specific reference signals from the PSCell or activated SCell and the E-UTRA deactivated SCC being measured are available in the same slot.

Table 8.2.1.2.5.2-1: Interruption length X3 and Y3 at measurements on deactivated E-UTRA SCC

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | NR Slot length | Interruption length X3 (slots) | | Interruption length Y3 (slots) | |
|  | (ms) | Sync | Async | Sync | Async |
| 0 | 1 | 1 | 2 | 1 | 2 |
| 1 | 0.5 | 1 | 2 | 1 | 2 |
| 2 | 0.25 | 3 | | 2 | 3 |
| 3 | 0.125 | 5 | | N/A | N/A |

###### 8.2.1.2.5.3 Interruptions during CQI measurements on dormant E-UTRAN SCell

When one E-UTRA SCell in MCG is dormant, the UE is allowed due to CQI measurements on the dormant E-UTRA SCell:

- an interruption on PSCell or any activated SCell with up to 0.5% probability of missed ACK/NACK.

Each interruption shall not exceed

- X3 slot, if the PSCell or activated SCell is not in the same band as the E-UTRA dormant SCell being measured, or

- X3 slot, if the PSCell or activated SCell is in the band overlapping or partially overlapping with the E-UTRA dormant SCC being measured, and UE not supporting [*requirementTypeIndication-r18*] indicates it is capable of *interBandMRDC-WithOverlapDL-Bands-r16* on this band pair or UE supporting [*requirementTypeIndication-r18*] indicates that it is capable of *interBandMRDC-WithOverlapDL-Bands-r16* on this band pairand is not provided with [*nonCollocatedTypeMRDC-r18*], or

- Y3 slot + SMTC duration, if the PSCell or activated SCell is in the same band or in the band overlapping or partially overlapping with the E-UTRA dormant SCell being measured, and UE does not report *interBandMRDC-WithOverlapDL-Bands-r16* on this band pair or UE supporting [*requirementTypeIndication-r18*] indicates that it is capable of *interBandMRDC-WithOverlapDL-Bands-r16* on this band pairand is provided with [*nonCollocatedTypeMRDC-r18*], provided the cell specific reference signals from the PSCell or activated SCell and the E-UTRA dormant SCell being measured are available in the same slot.

Where X3 and Y3 are defined in Table 8.2.1.2.5.2-1.

###### 8.2.1.2.5.4 Interruptions during RRM measurements on dormant E-UTRAN SCC

When one E-UTRA SCell in MCG is dormant, the UE is allowed due to RRM measurements on the E-UTRA SCC with the dormant E-UTRA SCell:

- an interruption on PSCell or any activated SCell with up to 0.5% probability of missed ACK/NACK.

Each interruption shall not exceed

- X3 slot, if the PSCell or activated SCell is not in the same band as the E-UTRA dormant SCC being measured, or

- X3 slot, if the PSCell or activated SCell is in the band overlapping or partially overlapping with the E-UTRA dormant SCC being measured, and UE not supporting [*requirementTypeIndication-r18*] reports *interBandMRDC-WithOverlapDL-Bands-r16* on this band pair or UE supporting [*requirementTypeIndication-r18*] reports *interBandMRDC-WithOverlapDL-Bands-r16* on this band pairandis not provided with [*nonCollocatedTypeMRDC-r18*], or

- Y3 slot + SMTC duration, if the PSCell or activated SCell is in the same band or in the band overlapping or partially overlapping with the E-UTRA dormant SCC being measured, and UE does not report *interBandMRDC-WithOverlapDL-Bands-r16* on this band pair or UE supporting [*requirementTypeIndication-r18*] reports *interBandMRDC-WithOverlapDL-Bands-r16* on this band pair and is provided with [*nonCollocatedTypeMRDC-r18*], provided the cell specific reference signals from the PSCell or activated SCell and the E-UTRA dormant SCC being measured are available in the same slot.

Where X3 and Y3 are defined in Table 8.2.1.2.5.2-1.

### < Unchanged Clauses Skipped >

###### 8.2.1.2.8.1 Interruptions during direct SCell activation and hibernation of E-UTRA SCell

When one E-UTRA SCell in MCG is directly activated and hibernated:

- the UE is allowed an interruption on any active serving cell in SCG:

- of up to X1 slots, if the active serving cell is not in the same band as any of the E-UTRA SCells being directly activated or hibernated, or

- of up to X1 slots, if the active serving cell is in the band overlapping or partially overlapping with any of the E-UTRA SCells being directly activated or hibernated, and UE not supporting [*requirementTypeIndication-r18*] reports *interBandMRDC-WithOverlapDL-Bands-r16* on this band pair or UE capable of [*requirementTypeIndication-r18*] reports *interBandMRDC-WithOverlapDL-Bands-r16* on this band pairand is not provided with [*nonCollocatedTypeMRDC-r18*], or

- of up to max{Y1 slots + TSMTC\_duration, 5ms} if the active serving cells are in the same band or in the band overlapping or partially overlapping with any of the E-UTRA SCells being directly activated or hibernated, and UE does not report *interBandMRDC-WithOverlapDL-Bands-r16* on this band pair or UE supporting [*requirementTypeIndication-r18*] reports *interBandMRDC-WithOverlapDL-Bands-r16* on this band pairand is provided with [*nonCollocatedTypeMRDC-r18*], provided the cell specific reference signals from the active serving cells and the E-UTRA SCells being directly activated or hibernated are available in the same slot, where TSMTC\_duration is the longest SMTC duration among all above active serving cells in MCG Where X1 and Y1 are specified in Table 8.2.1.2.3-1.

### < Unchanged Clauses Skipped >

##### 8.2.1.2.9 Interruptions at SCell hibernation

When one E-UTRA SCell in MCG is hibernated:

- the UE is allowed an interruption on any active serving cell in SCG:

- of up to X2 slots, if the active serving cell is not in the same band as any of the E-UTRA SCells being hibernated, or

- of up to X2 slots, if the active serving cell is in the band overlapping or partially overlapping with any of the E-UTRA SCells being hibernated, and UE not supporting [*requirementTypeIndication-r18*] reports *interBandMRDC-WithOverlapDL-Bands-r16* on this band pair or UE supporting [*requirementTypeIndication-r18*] reports *interBandMRDC-WithOverlapDL-Bands-r16* on this band pairand is not provided with [*nonCollocatedTypeMRDC-r18*], or

- of up to max{Y2 slots + TSMTC\_duration, 5ms}, if the active serving cells are in the same band or in the band overlapping or partially overlapping with any of the E-UTRA SCells being hibernated, and UE does not report *interBandMRDC-WithOverlapDL-Bands-r16* on this band pair or UE supporting [*requirementTypeIndication-r18*] reports *interBandMRDC-WithOverlapDL-Bands-r16* on this band pairand is provided with [*nonCollocatedTypeMRDC-r18*], provided the cell specific reference signals from the active serving cells and the E-UTRA SCells being hibernated are available in the same slot, where TSMTC\_duration is the longest SMTC duration among all above active serving cells in MCG.

Where X2 and Y2 are specified in Table 8.2.1.2.4-1.

### <Unchanged Text Skipped>

##### 8.2.2.2.1 Interruptions at SCell addition/release

When any number of SCells between one and 7 is added or released using the same *RRCConnectionReconfiguration* message as defined in TS 38.331 [2], the UE is allowed an interruption on any active serving cell during the RRC reconfiguration procedure as follows:

- an interruption on any active serving cell:

- of up to X1 slot, if the active serving cell and the SCell being added or released are in a FR1 band pair or in a FR1+FR2 band pair.

- of up to X1 slot, if the active serving cell and the SCell being added or released are in a FR2 band pair and UE is capable of independent beam management on this FR2 band pair.

- of up to X1 slot, if the active serving cell is non-contiguous to the SCell being added or released in the same FR1 band and UE is capable of [*intraBandNRCA-NonCollocated-r18*] and [*nonCollocatedTypeNR-CA-r18*] is not provided.

Where X1 is specified in Table 8.2.2.2.1-1.

or

- of up to the duration shown in table 8.2.2.2.1-2, if the active serving cells are contiguous to any of the SCells being added or released in the same FR1 band, or if the active serving cells are in the same FR1 band as any of the SCells being added or released and UE is not capable of [*intraBandNRCA-NonCollocated-r18*] or UE is capable of [*intraBandNRCA-NonCollocated-r18*] and [*nonCollocatedTypeNR-CA-r18*] is provided, provided the cell specific reference signals from the active serving cells and the SCells being added or released are available in the same slot.

- of up to the duration shown in table 8.2.2.2.1-2, if the active serving cells are in the same FR2 band as any of the SCells being added or released, provided the cell specific reference signals from the active serving cells and the SCells being added or released are available in the same slot.

Table 8.2.2.2.1-1: Interruption length X1 for SCell addition/release for inter-band CA

|  |  |  |  |
| --- | --- | --- | --- |
|  | NR Slot length (ms) of victim cell | Interruption length X1 (slots) | |
| 0 | 1 | 1 | |
| 1 | 0.5 | 2 | |
| 2 | 0.25 | Both aggressor cell and victim cell are on FR2 | 4 |
|  |  | Either aggressor cell or victim cell is on FR1 | 5 |
| 3 | 0.125 | Aggressor cell is on FR2 | 8 |
|  |  | Aggressor cell is on FR1 | 9 |
| 5 | 0.03125 | Aggressor cell is on FR1 | 33 |
| 6 | 0.015625 | Aggressor cell is on FR1 | 65 |

Table 8.2.2.2.1-2: Interruption duration for SCell addition/release for intra-band CA

|  |  |  |
| --- | --- | --- |
|  | NR Slot length (ms) | Interruption length (slots) |
| 0 | 1 | 1 + TSMTC\_duration \* |
| 1 | 0.5 | 2 + TSMTC\_duration \* |
| 2 | 0.25 | 4 + TSMTC\_duration \* |
| 3 | 0.125 | 8 + TSMTC\_duration \* |
| 5 | 0.03125 | 32+ TSMTC\_duration \* |
| 6 | 0.015625 | 64+ TSMTC\_duration \* |
| NOTE 1: TSMTC\_duration measured in subframes is  - the longest SMTC duration among all above active serving cells and the SCell being added when one SCell is added. If SSB configuration (*absoluteFrequencySSB*) but no SMTC configuration is provided for the SCell being added, the SSB transmission periodicity is assumed to be 5ms and TSMTC duration for the SCell being added is x ms, where x = the number of consecutive subframes containing all SSBs in one SSB burst transmitted by the SCell being added. If no SSB configuration (*absoluteFrequencySSB*) nor SMTC configuration is provided for the SCell being added, TSMTC duration for the SCell being added is 0ms;  - the longest SMTC duration among all active serving cells in the same band when one SCell is released.  NOTE 2: is as defined in TS 38.211 [6]. | | |

##### 8.2.2.2.2 Interruptions at SCell activation/deactivation

When an SCell is activated or deactivated as defined in TS 37.340 [17], the UE is allowed

- an interruption on any active serving cell:

- of up to X2 slot, if the active serving cell and the SCell being activated or deactivated are in a FR1 band pair or in a FR1+FR2 band pair.

- of up to X2 slot, if the active serving cell and the SCell being activated or deactivated are in a FR2 band pair and UE is capable of independent beam management on this FR2 band pair.

- of up to X2 slot, if the active serving cell is non-contiguous to the SCell being activated or deactivated in the same FR1 band and UE is capable of [*intraBandNRCA-NonCollocated-r18*] and [*nonCollocatedTypeNR-CA-r18*] is not provided.

Where X2 is specified in Table 8.2.2.2.2-1.

or

- of up to the duration shown in table 8.2.2.2.2-2, if the active serving cells are contiguous to any of the SCells being activated or deactivated in the same FR1 band, or if the active serving cells are in the same FR1 band as any of the SCells being activated or deactivated and UE is not capable of [*intraBandNRCA-NonCollocated-r18*] or UE is capable of [*intraBandNRCA-NonCollocated-r18*] and [*nonCollocatedTypeNR-CA-r18*] is provided, provided the cell specific reference signals from the active serving cells and the SCells being activated or deactivated are available in the same slot.

- of up to the duration shown in table 8.2.2.2.2-2, if the active serving cells are in the same FR2 band as any of the SCells being activated or deactivated provided the cell specific reference signals from the active serving cells and the SCells being activated or deactivated are available in the same slot.

Table 8.2.2.2.2-1: Interruption length X2 for SCell activation/deactivation for inter-band CA

|  |  |  |  |
| --- | --- | --- | --- |
|  | NR Slot length (ms) of victim cell | Interruption length X2 (slots) | |
| 0 | 1 |  | 1 |
| 1 | 0.5 |  | 1 |
| 2 | 0.25 | Both aggressor cell and victim cell are on FR2 | 2 |
|  |  | Either aggressor cell or victim cell is on FR1 | 3 |
| 3 | 0.125 | Aggressor cell is on FR2 | 4 |
|  |  | Aggressor cell is on FR1 | 5 |
| 5 | 0.03125 | Aggressor cell is on FR1 | 17 |
| 6 | 0.015625 | Aggressor cell is on FR1 | 33 |

Table 8.2.2.2.2-2: Interruption duration for SCell activation/deactivation for intra-band CA

|  |  |  |
| --- | --- | --- |
|  | NR Slot length (ms) | Interruption length (slots) |
| 0 | 1 | 1 + TSMTC\_duration \* |
| 1 | 0.5 | 1 + TSMTC\_duration \* |
| 2 | 0.25 | 2 + TSMTC\_duration \* |
| 3 | 0.125 | 4 + TSMTC\_duration \* |
| 5 | 0.03125 | 16+ TSMTC\_duration \* |
| 6 | 0.015625 | 32+ TSMTC\_duration \* |
| NOTE 1: TSMTC\_duration measured in subframes is  - the longest SMTC duration among all above active serving cells and the SCell being activated when one SCell is activated. If SSB configuration (*absoluteFrequencySSB*) but no SMTC configuration is provided for the SCell being activated, the SSB transmission periodicity is assumed to be 5ms and TSMTC duration for the SCell being activated is x ms, where x = the number of consecutive subframes containing all SSBs in one SSB burst transmitted by the SCell being activated. If no SSB configuration (*absoluteFrequencySSB*) nor SMTC configuration is provided for the SCell being activated, TSMTC duration for the SCell being activated is 0ms;  - the longest SMTC duration among all active servingNOTE 2: is as defined in TS 38.211 [6]. | | |

##### 8.2.2.2.3 Interruptions during measurements on deactivated SCC

Interruptions on PCell or activated SCell(s) due to measurements when an SCell is deactivated are allowed with up to 0.5% probability of missed ACK/NACK when the configured *measCycleSCell* [2] is 640 ms or longer.

* If the PCell or activated SCell(s) is not in the same band as the deactivated SCell, the UE is only allowed to cause interruptions on PCell or activated SCell(s) immediately before and immediately after an SMTC. Each interruption shall not exceed requirement in Table 8.2.2.2.2-1.
* If the PCell or activated SCell(s) is non-contiguous to the deactivated SCell in the same FR1 band and UE is capable of [*intraBandNRCA-NonCollocated-r18*] on this FR1 band and [*nonCollocatedTypeNR-CA-r18*] is not provided, the UE is only allowed to cause interruptions on PCell or activated SCell(s) immediately before and immediately after an SMTC. Each interruption shall not exceed requirement in Table 8.2.2.2.2-1.
* If the PCell or activated SCell(s) is contiguous to the deactivated SCell in the same FR1 band, or if the PCell or activated SCell(s) is in the same FR1 band as the deactivated SCell and UE is not capable of [*intraBandNRCA-NonCollocated-r18*] or UE is capable of [*intraBandNRCA-NonCollocated-r18*] and [*nonCollocatedTypeNR-CA-r18*] is provided, the UE is only allowed to cause an interruption on PCell or activated SCell(s) no earlier than X slots before TSMTC\_duration and no later than X slots after TSMTC\_duration, provided the cell specific reference signals from the active serving cells and the deactivated SCell are available in the same slot, where X and TSMTC\_duration are given by Table 8.2.2.2.3-1. The interruption shall not exceed requirements in Table 8.2.2.2.3-1.
* If the PCell or activated SCell(s) is in the same FR2 band as the deactivated SCell, the UE is only allowed to cause an interruption on PCell or activated SCell(s) no earlier than X slots before TSMTC\_duration and no later than X slots after TSMTC\_duration, provided the cell specific reference signals from the active serving cells and the deactivated SCell are available in the same slot, where X and TSMTC\_duration are given by Table 8.2.2.2.3-1. The interruption shall not exceed requirements in Table 8.2.2.2.3-1.

The interruption requirements in Table 8.2.2.2.3-1 are not applicable when a UE is configured with NCSG unless the SMTC on the deactivated SCC is fully non-overlapped with NCSG.

Table 8.2.2.2.3-1: Interruption duration for measurement on deactivated SCell for intra-band CA

|  |  |  |  |
| --- | --- | --- | --- |
|  | NR Slot length (ms) | X (slots) | Interruption length (slots) |
| 0 | 1 | 1 | 2 + TSMTC\_duration \* |
| 1 | 0.5 | 1 | 2 + TSMTC\_duration \* |
| 2 | 0.25 | 2 | 4 + TSMTC\_duration \* |
| 3 | 0.125 | 4 | 8 + TSMTC\_duration \* |
| 5 | 0.03125 | 16 | 32 + TSMTC\_duration \* |
| 6 | 0.015625 | 32 | 64 + TSMTC\_duration \* |
| NOTE 1: TSMTC\_duration measured in subframes is the longest SMTC duration among all above active serving cells and the deactivated SCell to be measured;  NOTE 2: is as defined in TS 38.211 [6]. | | | |

### <Unchanged Text Skipped>

### 8.3.2 SCell Activation Delay Requirement for Deactivated SCell

The requirements in this clause shall apply for the UE configured with one downlink SCell in EN-DC, or in standalone NR carrier aggregation or in NE-DC or in NR-DC and when one SCell is being activated.

The delay within which the UE shall be able to activate the deactivated SCell depends upon the specified conditions.

Upon receiving SCell activation command in slot *n*, the UE shall be capable to transmit valid CSI report and apply actions related to the activation command for the SCell being activated no later than in slot , where:

THARQ (in ms) is the timing between DL data transmission and acknowledgement as specified in TS 38.213 [3]

Tactivation\_time is the SCell activation delay in millisecond.

If the SCell is known and belongs to FR1, Tactivation\_time is:

- TFirstSSB+ 5ms, if the measurement period of the SCell being activated is equal to or smaller than 2400ms.

- TFirstSSB\_MAX + Trs + 5ms, if the measurement period of the SCell being activated is larger than 2400ms.

If the SCell is unknown and belongs to FR1, and if one of the following conditions is met

- ‘ssb-PositionInBurst’ indicates only one SSB is being actually transmitted, or

- ‘ssb-PositionInBurst’ indicates multiple SSBs and TCI indication is provided in same MAC PDU with SCell activation,

provided that the side condition Ês/Iot ≥ -2dB is fulfilled, Tactivation\_time is:

- TFirstSSB\_MAX + TSMTC\_MAX + Trs + 5ms, if the following conditions are met,

- the SCell is contiguous to an active serving cell in the same band, and

- its *ssb-PositionInBurst* is same as the one of contiguous FR1 active serving cell, and

- its SMTC offset is same as the one of contiguous FR1 active serving cell, and

- its RTD with contiguous FR1 active serving cell is smaller than or equal to 260ns with respect to the to-be-activated SCell’s SSB numerology, and its reception power difference with contiguous FR1 active serving cell is smaller than or equal to 6dB;

- TFirstSSB\_MAX + TSMTC\_MAX + 2\*Trs + 5ms, otherwise.

otherwise, provided that the side condition Ês/Iot ≥ -2dB is fulfilled, Tactivation\_time is:

- 6ms + TFirstSSB\_MAX + TSMTC\_MAX + Trs + TL1-RSRP,measure + TL1-RSRP,report + THARQ + max(Tuncertainty\_MAC + TFineTiming + 2ms, Tuncertainty\_SP), if semi-persistent CSI-RS is used for CSI reporting,

- 3ms + TFirstSSB\_MAX + TSMTC\_MAX + Trs + TL1-RSRP,measure + TL1-RSRP,report + max(THARQ + Tuncertainty\_MAC + 5ms + TFineTiming, Tuncertainty\_RRC + TRRC\_delay), if periodic CSI-RS is used for CSI reporting.

- However, when the following conditions are fulfilled, no activation requirement will be applied for this unknown SCell:

- the SCell is contiguous to an active serving cell in the same band, and

- A single SSB is used in the unknown SCell; or multiple SSBs are used in the SCell and TCI state indication for PDCCH is provided by the same MAC PDU used for SCell activation; and

- its *ssb-PositionInBurst* is same as the one of contiguous FR1 active serving cell, and

- its SMTC offset is same as the one of contiguous FR1 active serving cell

- its RTD with contiguous FR1 active serving cell is larger than 260ns with respect to the to-be-activated SCell’s SSB numerology, or its reception power difference with contiguous FR1 active serving cell is larger than 6dB;

If the SCell being activated belongs to FR1 and if there is at least one active serving cell contiguous to the SCell on that FR1 band, if the UE is not provided with SSB configuration (*absoluteFrequencySSB*) nor SMTC configuration for the target SCell, Tactivation\_time is 3 ms for UE supporting *scellWithoutSSB*, provided

- The RTD between the target SCell and the contiguous active serving cell is within within ±260ns, and

- The difference of the reception power with the contiguous active serving cell is <= 6dB, and

- The RS(s) of SCell being activated is (are) QCL-TypeA with TRS(s) of the SCell being activated, and the TRS(s) of the SCell being activated is (are) further QCL-TypeC with SSB(s) of any active serving cell that is contiguous to the SCell being activated on that FR1 band.

If the SCell being activated belongs to FR2 and if there is at least one active serving cell on that FR2 band, then Tactivation\_time is TFirstSSB+ 5ms provided:

- The UE is provided with SMTC for the target SCell, and

- The SSBs in the serving cell(s) and the SSBs in the SCell fulfil the condition defined in clause 3.6.3, and

- The parameter ssb-PositionsInBurst is same for the serving cell(s) and the Scell, and

- SSB is in the same half-frame on the SCell and the contiguous FR2 active serving cell.

If the SCell being activated belongs to FR2 and if there is at least one active serving cell on that FR2 band, if the UE supporting *scellWithoutSSB* is not provided with any SMTC for the target SCell, Tactivation\_time is 3 ms, provided

- the RS (s) of SCell being activated is (are) QCL-TypeD with RS (s) of one active serving cell on that FR2 band.

If the SCell being activated belongs to FR2 and if there is no active serving cell on that FR2 band provided that PCell or PSCell is in FR1 or in FR2:

If the target SCell is known to UE and semi-persistent CSI-RS is used for CSI reporting, then Tactivation\_time is:

- 3ms + max(Tuncertainty\_MAC + TFineTiming + 2ms, Tuncertainty\_SP), where Tuncertainty\_MAC=0 and Tuncertainty\_SP=0 if UE receives the SCell activation command, semi-persistent CSI-RS activation command and TCI state activation command at the same time.

If the target SCell is known to UE and periodic CSI-RS is used for CSI reporting, then Tactivation\_time is:

- max(Tuncertainty\_MAC + 5ms + TFineTiming, Tuncertainty\_RRC + TRRC\_delay-THARQ), where Tuncertainty\_MAC=0 if UE receives the SCell activation command and TCI state activation commands at the same time.

If the PCell/PSCell and the target SCell are configured as FR1-FR2-1 CA or if the PCell/PSCell and the target SCell are in a FR2-1 band pair with independent beam management, and the target SCell is unknown to UE and semi-persistent CSI-RS is used for CSI reporting, provided that the side condition Ês/Iot ≥ -2dB is fulfilled, then Tactivation\_time is:

- 6ms + TFirstSSB\_MAX + 15\*TSMTC\_MAX + 8\*Trs + TL1-RSRP, measure + TL1-RSRP, report + THARQ + max(Tuncertainty\_MAC + TFineTiming + 2ms, Tuncertainty\_SP).

If the PCell/PSCell and the target SCell are configured as FR1-FR2-2 CA or if the PCell/PSCell and the target SCell are in a FR2-2 band pair with independent beam management, and the target SCell is unknown to UE and semi-persistent CSI-RS is used for CSI reporting, provided that the side condition Ês/Iot ≥ -2dB is fulfilled, then Tactivation\_time is:

- 6ms + TFirstSSB\_MAX + 23\*TSMTC\_MAX + 12\*Trs + TL1-RSRP, measure + TL1-RSRP, report + THARQ + max(Tuncertainty\_MAC + TFineTiming + 2ms, Tuncertainty\_SP).

If the PCell/PSCell and the target SCell are configured as FR1-FR2-1 CA or if the PCell/PSCell and the target SCell are in a FR2-1 band pair with independent beam management, and the target SCell is unknown to UE and periodic CSI-RS is used for CSI reporting, provided that the side condition Ês/Iot ≥ -2dB is fulfilled, then Tactivation\_time is:

- 3ms + TFirstSSB\_MAX + 15\*TSMTC\_MAX + 8\*Trs + TL1-RSRP, measure + TL1-RSRP, report + max {(THARQ + Tuncertainty\_MAC + 5ms + TFineTiming), (Tuncertainty\_RRC + TRRC\_delay)}.

If the PCell/PSCell and the target SCell are configured as FR1-FR2-2 CA or if the PCell/PSCell and the target SCell are in a FR2-2 band pair with independent beam management, and the target SCell is unknown to UE and periodic CSI-RS is used for CSI reporting, provided that the side condition Ês/Iot ≥ -2dB is fulfilled, then Tactivation\_time is:

- 3ms + TFirstSSB\_MAX + 23\*TSMTC\_MAX + 12\*Trs + TL1-RSRP, measure + TL1-RSRP, report + max {(THARQ + Tuncertainty\_MAC + 5ms + TFineTiming), (Tuncertainty\_RRC + TRRC\_delay)}.

where,

TSMTC\_MAX:

- In FR1, in case of intra-band contiguous SCell activation or in case of intra-band non-contiguous SCell activation for UE not capable of [*intraBandNRCA-NonCollocated-r18*] or UE is capable of [*intraBandNRCA-NonCollocated-r18*] and [*nonCollocatedTypeNR-CA-r18*] is provided, TSMTC\_MAX is the longer SMTC periodicity between active serving cells and SCell being activated provided the cell specific reference signals from the active serving cells and the SCells being activated or released are available in the same slot; in case of intra-band non-contiguous SCell activation for UE capable of [*intraBandNRCA-NonCollocated-r18*] and [*nonCollocatedTypeNR-CA-r18*] is not provided or in case of inter-band SCell activation, TSMTC\_MAX is the SMTC periodicity of SCell being activated.

- In FR2, in case of intra-band SCell activation, TSMTC\_MAX is the longer SMTC periodicity between active serving cells and SCell being activated provided that in Rel-15 only support FR2 intra-band CA; in case of FR2 inter-band SCell activation, TSMTC\_MAX is the SMTC periodicity of SCell being activated.

- TSMTC\_MAX is bounded to a minimum value of 10ms.

Trs is the SMTC periodicity of the SCell being activated if the UE has been provided with an SMTC configuration for the SCell in SCell addition message, otherwise Trs is the SMTC configured in the measObjectNR having the same SSB frequency and subcarrier spacing. If the measObjectNRs having the same SSB frequency and subcarrier spacing configured by MN and SN have different SMTC, Trs is the periodicity of one of the SMTC which is up to UE implementation. If the UE is not provided SMTC configuration or measurement object on this frequency, the requirement which involves Trs is applied with Trs = 5ms assuming the SSB transmission periodicity is 5ms. There are no requirements if the SSB transmission periodicity is not 5ms

TFirstSSB: is the time to the end of the first complete SSB burst indicated by the SMTC, or within 5ms if SMTC is not configured, after slot n + .

TFirstSSB\_MAX: Is the time to the end of the first complete SSB burst indicated by the SMTC, or within 5ms if SMTC is not configured, after slot n + , further fulfilling:

- In FR1, in case of intra-band contiguous SCell activation or in case of intra-band non-contiguous SCell activation for UE not capable of [*intraBandNRCA-NonCollocated-r18*] or UE is capable of [*intraBandNRCA-NonCollocated-r18*] and [*nonCollocatedTypeNR-CA-r18*] is provided, the occasion when all active serving cells and SCells being activated or released are transmitting SSB bursts in the same slot; in case of intra-band non-contiguous SCell activation for UE capable of [*intraBandNRCA-NonCollocated-r18*] and [*nonCollocatedTypeNR-CA-r18*] is not provided or in case of inter-band SCell activation, the first occasion when the SCell being activated is transmitting SSB burst.

- In FR2, the occasion when all active serving cells and SCells being activated or released are transmitting SSB bursts in the same slot.

TFineTiming is the time period between UE finish processing the last activation command for PDCCH TCI, PDSCH TCI (when applicable) and the timing of first complete available SSB corresponding to the TCI state.

TL1-RSRP, measure is L1-RSRP measurement delay TL1-RSRP\_Measurement\_Period\_SSB msor TL1-RSRP\_Measurement\_Period\_CSI-RS based on applicability as defined in clause 9.5 assuming M=1 and TReport=0.

TL1-RSRP, report is delay of acquiring CSI reporting resources.

Tuncertainty\_MAC is the time period between reception of the last activation command for PDCCH TCI, PDSCH TCI (when applicable) relative to

- SCell activation command for known case;

- First valid L1-RSRP reporting for unknown case.

Tuncertainty\_RRC is the time period between reception of the RRC configuration message for TCI of periodic CSI-RS for CQI reporting (when applicable) relative to

- SCell activation command for known case;

- First valid L1-RSRP reporting for unknown case.

Tuncertainty\_SP is the time period between reception of the activation command for semi-persistent CSI-RS resource set for CQI reporting relative to

- SCell activation command for known case;

- First valid L1-RSRP reporting for unknown case.

TRRC\_delay is the RRC procedure delay as specified in TS38.331 [2].

Longer delays for RRM measurement requirements, and in case of FR2 also SSB based RLM/BFD/CBD/L1-RSRP measurement requirements, can be expected during the cell detection time for unknown SCell activation.

When *absoluteFrequencySSB* is not configured in *DownlinkConfigCommon* for target SCell but SMTC for target SCell is configured, no requirement would be applied.

TCSI\_reporting is the delay (in ms) including uncertainty in acquiring the first available downlink CSI reference resource, UE processing time for CSI reporting and uncertainty in acquiring the first available CSI reporting resources as specified in TS 38.331 [2].

SCell in FR1 is known if it has been meeting the following conditions:

- During the period equal to max(5\*measCycleSCell,  5\*DRX cycles) for FR1 before the reception of the SCell activation command:

- the UE has sent a valid measurement report for the SCell being activated and

- the SSB measured remains detectable according to the cell identification conditions specified in clause 9.2 and 9.3.

- the SSB measured during the period equal to max(5\*measCycleSCell, 5\*DRX cycles) also remains detectable during the SCell activation delay according to the cell identification conditions specified in clause 9.2 and 9.3.

Otherwise SCell in FR1 is unknown.

For the first SCell activation in FR2 bands, the SCell is known if it has been meeting the following conditions:

- During the period equal to 4s for UE supporting power class 1/5 and 3s for UE supporting power class 2/3/4 before UE receives the last activation command for PDCCH TCI, PDSCH TCI (when applicable) and semi-persistent CSI-RS for CQI reporting (when applicable):

- the UE has sent a valid L3-RSRP measurement report with SSB index, and

- SCell activation command is received after L3-RSRP reporting and no later than the time when UE receives MAC-CE command for TCI activation

- During the period from L3-RSRP reporting to the valid CQI reporting, the reported SSBs with indexes remain detectable according to the cell identification conditions specified in clauses 9.2 and 9.3, and the TCI state is selected based on one of the latest reported SSB indexes.

Otherwise, the first SCell in FR2 band is unknown. The requirement for unknown SCell applies provided that the activation commands for PDCCH TCI, PDSCH TCI (when applicable), semi-persistent CSI-RS for CQI reporting (when applicable), and configuration message for TCI of periodic CSI-RS for CQI reporting (when applicable) are based on the latest valid L1-RSRP reporting.

If the UE has been provided with higher layer in TS 38.331 [2] signaling of *smtc2*prior to the activation command, TSMTC\_Scell follows *smtc1* or *smtc2* according to the physical cell ID of the target cell being activated. TSMTC\_MAX follows *smtc1* or *smtc2* according to the physical cell IDs of the target cells being activated and the active serving cells.

In addition to CSI reporting defined above, UE shall also apply other actions related to the activation command specified in TS 38.331 [2] for a SCell at the first opportunities for the corresponding actions once the SCell is activated.

The starting point of an interruption window on spCell or any activated SCell, as specified in clause 8.2, shall not occur before slot n+1+ and not occur after slot slot n+1+, where NR slot length is with respect to the numerology used in the SCell being activated, and TX is:

- 0, if Tactivation\_time is 3ms;

- TFirstSSB, for any scenario where Tactivation\_time includes TFirstSSB;

- TFirstSSB\_MAX, for any scenario where Tactivation\_time includes TFirstSSB\_MAX;

- Tuncertainty\_MAC +TFineTiming, for any scenario where Tactivation\_time includes only TFineTiming and no TFirstSSB\_MAX.

The length of the interruption window may be different for different victim cells, and depends on the applicable scenario and on the frequency band relation between the aggressor cell and the victim cell.

The requirements in this clause and requriements on interruption due to SCell activation in clause 8.2 apply provided that the SSB of the to-be-activated SCell is within the first active DL BWP of the Scell.

Starting from the slot specified in clause 4.3 of TS 38.213 [3] (timing for secondary Cell activation/deactivation) and until the UE has completed the SCell activation, the UE shall report out of range if the UE has available uplink resources to report CQI for the SCell.

Starting from the slot specified in clause 4.3 of TS 38.213 [3] (timing for secondary Cell activation/deactivation) and until the UE has completed a first L1-RSRP measurement, the UE shall report lowest valid L1 SS-RSRP range if the UE has available uplink resources to report L1-RSRP for the SCell.

### <Unchanged Text Skipped>

### 8.5.2 Requirements for SSB based beam failure detection

#### 8.5.2.1 Introduction

The requirements in this clause apply for each SSB resource in the set  configured for a serving cell, provided that the SSB configured for beam failure detection is actually transmitted within the UE active DL BWP during the entire evaluation period specified in clause 8.5.2.2. The requirements in this clause could not be applicable if UE is required to perform beam failure detection on more than 1 serving cell per band unless otherwise specified. For UE supporting *[intraBandNRCA-NonCollocated-r18]* and [*nonCollocatedTypeNR-CA-r18*] is not provided for the configured FR1 intra-band non-contiguous CA, the requirements in this clause apply when UE is required to perform beam failure detection on no more than 2 serving cells per band if these 2 serving cells are in non-contiguous carriers, and no more than 1 serving cell per band otherwise.

Table 8.5.2.1-1: PDCCH transmission parameters for beam failure instance

|  |  |
| --- | --- |
| Attribute | Value for BLER |
| DCI format | 1-0 |
| Number of control OFDM symbols | 2 |
| Aggregation level (CCE) | 8 |
| Ratio of hypothetical PDCCH RE energy to average SSS RE energy | 0dB |
| Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | 0dB |
| Bandwidth (PRBs) | 24 |
| Sub-carrier spacing (kHz) | Same as the SCS of RMSI CORESET |
| DMRS precoder granularity | REG bundle size |
| REG bundle size | 6 |
| CP length | Normal |
| Mapping from REG to CCE | Distributed |

### <Unchanged Text Skipped>

### 8.5.5 Requirements for SSB based candidate beam detection

#### 8.5.5.1 Introduction

The requirements in this clause apply for each SSB resource in the set  configured for a serving cell, provided that the SSBs configured for candidate beam detection are actually transmitted within UE active DL BWP during the entire evaluation period specified in clause 8.5.5.2. The requirements in this clause apply when UE is required to perform beam failure detection on no more than 1 serving cell per band unless otherwise specified. For UE supporting *[intraBandNRCA-NonCollocated-r18]* and if [*nonCollocatedTypeNR-CA-r18*] is not provided for the configured FR1 intra-band non-contiguous CA, the requirements in this clause apply when UE is required to perform beam failure detection on no more than 2 serving cells per band if these 2 serving cells are in non-contiguous carriers, and no more than 1 serving cell per band otherwise.

### <Unchanged Text Skipped>

### 8.5.6 Requirements for CSI-RS based candidate beam detection

#### 8.5.6.1 Introduction

The requirements in this clause apply for each CSI-RS resource in the set  configured for a serving cell, provided that the CSI-RS resources configured for candidate beam detection are actually transmitted within UE active DL BWP during the entire evaluation period specified in clause 8.5.6.2. The requirements in this clause apply when UE is required to perform beam failure detection on no more than 1 serving cell per band unless otherwise specified. For UE supporting *[intraBandNRCA-NonCollocated-r18]* and if [*nonCollocatedTypeNR-CA-r18*] is not providedfor the configured FR1 intra-band non-contiguous CA, the requirements in this clause apply when UE is required to perform beam failure detection on no more than 2 serving cells per band if these 2 serving cells are in non-contiguous carriers, and no more than 1 serving cell per band otherwise.

### <Unchanged Text Skipped>

#### 8.5.7.2 Scheduling availability of UE performing beam failure detection with a different subcarrier spacing than PDSCH/PDCCH on FR1

For UEs which support *simultaneousRxDataSSB-DiffNumerology* [14] there are no restrictions on scheduling availability due to beam failure detection when SSB is configured as BFD. For UEs which do not support *simultaneousRxDataSSB-DiffNumerology* [14] the following restrictions apply due to beam failure detection when SSB is configured as BFD.

- The UE is not expected to transmit PUCCH, PUSCH or SRS or receive PDCCH, PDSCH or CSI-RS for tracking or CSI-RS for CQI on SSB symbols to be measured for beam failure detection.

When intra-band carrier aggregation in FR1 is configured, the scheduling restrictions on FR1 serving PCell or PSCell apply to all serving cells in the same band on the symbols that fully or partially overlap with restricted symbols.

When intra-band non-contiguous carrier aggregation is configured for a UE indicating [*intraBandNR-CA-non-collocated-r18*] and if [*nonCollocatedTypeNR-CA-r18*] is not provided, there are no scheduling restrictions on FR1 serving cell(s) configured on the non-contiguous CC(s) in the same band. Otherwise, the scheduling restrictions on FR1 serving PCell or PSCell apply to all serving cells in the same band on the symbols that fully or partially overlap with restricted symbols if [*nonCollocatedTypeNR-CA-r18*] is provided.

When inter-band carrier aggregation within FR1 is configured, there are no scheduling restrictions on FR1 serving cell(s) configured in other bands than the bands in which PCell or PSCell is configured.

### <Unchanged Text Skipped>

#### 8.5.8.2 Scheduling availability of UE performing L1-RSRP measurement with a different subcarrier spacing than PDSCH/PDCCH on FR1

For UEs which support *simultaneousRxDataSSB-DiffNumerology* [14] there are no restrictions on scheduling availability due to L1-RSRP measurement based on SSB as link recovery detection resource. For UEs which do not support *simultaneousRxDataSSB-DiffNumerology* [14] the following restrictions apply due to L1-RSRP measurement based on SSB configured as link recovery detection resource.

- The UE is not expected to transmit PUCCH, PUSCH or SRS or receive PDCCH, PDSCH, TRS, CSI-RS for tracking or CSI-RS for CQI on SSB symbols to be measured for L1-RSRP.

When intra-band carrier aggregation in FR1 is configured, the scheduling restrictions on one serving cell apply to all other serving cells in the same band on the symbols that fully or partially overlap with the restricted symbols.

When intra-band non-contiguous carrier aggregation is configured for a UE indicating [*intraBandNR-CA-non-collocated-r18*] and if [*nonCollocatedTypeNR-CA-r18*] is not provided, there are no scheduling restrictions on FR1 serving cell(s) configured on the non-contiguous CC(s) in the same band. Otherwise, the scheduling restrictions on one serving cell apply to all other serving cells in the same band on the symbols that fully or partially overlap with the restricted symbols if [*nonCollocatedTypeNR-CA-r18*] is provided.

When inter-band carrier aggregation within FR1 is configured, there are no scheduling restrictions on FR1 serving cell(s) configured in other bands.

### <Unchanged Text Skipped>

##### 9.2.5.3.1 Scheduling availability of UE performing measurements in TDD bands on FR1

When the UE performs intra-frequency measurements in a TDD band, the following restrictions apply due to SS-RSRP or SS-SINR measurement

- The UE is not expected to transmit PUCCH/PUSCH/SRS on SSB symbols to be measured, and on 1 data symbol before each consecutive SSB symbols to be measured and 1 data symbol after each consecutive SSB symbols to be measured within SMTC window duration. If the high layer in TS 38.331 [2] signalling of *smtc2*is configured, the SMTC periodicityfollows *smtc2*; Otherwise SMTC periodicity follows *smtc1.*

When the UE performs intra-frequency measurements in a TDD band, the following restrictions apply due to SS-RSRQ measurement

- The UE is not expected to transmit PUCCH/PUSCH/SRS on SSB symbols to be measured, RSSI measurement symbols, and on 1 data symbol before each consecutive SSB to be measured/RSSI symbols and 1 data symbol after each consecutive SSB to be measured/RSSI symbols within SMTC window duration. If the high layer signalling of *smtc2*is configured in TS 38.331 [2], the SMTC periodicityfollows *smtc2*; Otherwise the SMTC periodicity follows *smtc1.*

When TDD intra-band carrier aggregation is performed, the scheduling restrictions due to a given serving cell should also apply to all other serving cells in the same band on the symbols that fully or partially overlap with the aforementioned restricted symbols.

When intra-band non-contiguous carrier aggregation is configured for a UE indicating [*intraBandNR-CA-non-collocated-r18*] and if [*nonCollocatedTypeNR-CA-r18*] is not provided, there are no scheduling restrictions on FR1 serving cell(s) to be measured and configured on the non-contiguous CC(s) in the same band. Otherwise, the scheduling restrictions due to a given serving cell should also apply to all other serving cells in the same band on the symbols that fully or partially overlap with the aforementioned restricted symbols if *nonCollocatedTypeNR-CA-r18*] is provided.

When TDD inter-band carrier aggregation is performed, the scheduling restrictions due to a given serving cell should also apply to another serving cell in a different band on the symbols that fully or partially overlap with the aforementioned restricted symbols, if UE does not have the capability of supporting *simultaneousRxTxInterBandCA* for this band pair.

##### 9.2.5.3.2 Scheduling availability of UE performing measurements with a different subcarrier spacing than PDSCH/PDCCH on FR1

For UE which do not support *simultaneousRxDataSSB-DiffNumerology* [14] the following restrictions apply due to SS-RSRP/RSRQ/SINR measurement

- If *deriveSSB\_IndexFromCell* is enabled the UE is not expected to transmit PUCCH/PUSCH/SRS or receive PDCCH/PDSCH/TRS/CSI-RS for CQI on SSB symbols to be measured, and on 1 data symbol before each consecutive SSB symbols to be measured and 1 data symbol after each consecutive SSB symbols to be measured within SMTC window duration. If the high layer signalling of *smtc2*is configured(in TS 38.331 [2]), the SMTC periodicityfollows *smtc2*; Otherwise the SMTC periodicity follows *smtc1.*

- If *deriveSSB\_IndexFromCell* is not enabled the UE is not expected to transmit PUCCH/PUSCH/SRS or receive PDCCH/PDSCH/TRS/CSI-RS for CQI on all symbols within SMTC window duration. If the high layer signalling of *smtc2*is configured in TS 38.331 [2], the SMTC periodicityfollows *smtc2*; Otherwise the SMTC periodicity follows *smtc1.*

If the following conditions are met:

- The UE has been notified about system information update through paging,

- The gap between the UE’s reception of PDCCH that UE monitors in the Type 2-PDCCH CSS set that notifies system information update, and the PDCCH that UE monitors in the Type0-PDCCH CSS set, is greater than 2 slots

The UE is expected to receive the PDCCH that the UE monitors in the Type0-PDCCH CSS set, and/or the corresponding PDSCH, on SSB symbols to be measured.

When intra-band carrier aggregation is performed, the scheduling restrictions due to a given serving cell should also apply to all other serving cells in the same band on the symbols that fully or partially overlap with the aforementioned restricted symbols.

When intra-band non-contiguous carrier aggregation is configured for a UE indicating [*intraBandNR-CA-non-collocated-r18*] and if [*nonCollocatedTypeNR-CA-r18*] is not provided, there are no scheduling restrictions on FR1 serving cell(s) to be measured and configured on the non-contiguous CC(s) in the same band. Otherwise, the scheduling restrictions due to a given serving cell should also apply to all other serving cells in the same band on the symbols that fully or partially overlap with the aforementioned restricted symbols if *nonCollocatedTypeNR-CA-r18*] is provided.

### <Unchanged Text Skipped>

##### 9.3.9.3.1 Scheduling availability of UE performing measurements in TDD bands on FR1

When UE performs inter-frequency measurements without measurement gaps in a TDD band, the following restrictions apply due to SS-RSRP or SS-SINR measurement

- UE is not expected to transmit PUCCH/PUSCH/SRS on SSB symbols to be measured, and on 1 data symbol before each consecutive SSB symbols to be measured and 1 data symbol after each consecutive SSB symbols to be measured within SMTC window duration.

When UE performs inter-frequency measurements without measurement gaps in a TDD band, the following restrictions apply due to SS-RSRQ measurement

- UE is not expected to transmit PUCCH/PUSCH/SRS on SSB symbols to be measured, RSSI measurement symbols, and on 1 data symbol before each consecutive SSB to be measured/RSSI symbols and 1 data symbol after each consecutive SSB to be measured/RSSI symbols within SMTC window duration.

When TDD intra-band carrier aggregation is performed, the scheduling restrictions due to one serving cell should also apply to all other serving cells in the same band on the symbols that fully or partially overlap with aforementioned restricted symbols.

When intra-band non-contiguous carrier aggregation is configured for a UE indicating [*intraBandNR-CA-non-collocated-r18*] and if [*nonCollocatedTypeNR-CA-r18*] is not provided, there are no scheduling restrictions on FR1 serving cell(s) to be measured and configured on the non-contiguous CC(s) in the same band. Otherwise, the scheduling restrictions due to one serving cell should also apply to all other serving cells in the same band on the symbols that fully or partially overlap with aforementioned restricted symbols if [*nonCollocatedTypeNR-CA-r18*] is provided

##### 9.3.9.3.2 Scheduling availability of UE performing measurements with a different subcarrier spacing than PDSCH/PDCCH on FR1

For UE which do not support *simultaneousRxDataSSB-DiffNumerology-Inter-r16* [14] the following restrictions apply due to SS-RSRP/RSRQ/SINR measurement

- If UE performs inter-frequency measurements without measurement gaps in a TDD band, UE is not expected to transmit PUCCH/PUSCH/SRS or receive PDCCH/PDSCH/TRS/CSI-RS for CQI on SSB symbols to be measured, and on 1 data symbol before each consecutive SSB symbols to be measured and 1 data symbol after each consecutive SSB symbols to be measured within SMTC window duration.

- If UE performs inter-frequency measurements without measurement gaps in a FDD band, UE is not expected to transmit PUCCH/PUSCH/SRS or receive PDCCH/PDSCH/TRS/CSI-RS for CQI on the union of restricted serving cell symbols due to measurement of all MOs, where the restricted serving cell symbols due to measurement of MO *i* include

- serving cell symbols fully or partially overlap with SSB symbols to be measured on MO i, and △t serving cell symbol before each consecutive SSB symbols to be measured and △t serving cell symbol after each consecutive SSB symbols to be measured within SMTC window duration, if deriveSSB-IndexFromCellInter-r17 is enabled for MO i and UE supporting *deriveSSB-IndexFromCellInterNon-NCSG-r17*. △t is defined as the minimum integer number of symbols with total duration no smaller than the tolerance specified in clause 7.9, or

- serving cell symbols fully or partially overlap with SMTC window for MO i and on 1 serving cell symbol before and after the SMTC window, if deriveSSB-IndexFromCellInter-r17 is not enabled for MO i, or UE supporting *deriveSSB-IndexFromCellInterNon-NCSG-r17*,

When intra-band carrier aggregation is performed, the scheduling restrictions due to a given serving cell should also apply to all other serving cells in the same band on the symbols that fully or partially overlap with aforementioned restricted symbols.

When intra-band non-contiguous carrier aggregation is configured for a UE indicating [*intraBandNR-CA-non-collocated-r18*] and if [*nonCollocatedTypeNR-CA-r18*] is not provided, there are no scheduling restrictions on FR1 serving cell(s) to be measured and configured on the non-contiguous CC(s) in the same band. Otherwise, the scheduling restrictions due to a given serving cell should also apply to all other serving cells in the same band on the symbols that fully or partially overlap with aforementioned restricted symbols if [*nonCollocatedTypeNR-CA-r18*] is provided.

### <Unchanged Text Skipped>

##### 9.3.10.3.1 Scheduling availability of UE performing measurements in TDD bands on FR1

When the UE performs inter-frequency measurements with NCSG in a TDD band, the following restrictions apply due to SS-RSRP or SS-SINR measurement when (1) *simultaneousRxTxInterBandCA* is not supported for the target measurement band and the serving cell’s band, or (2) target measurement and the serving cell are on the same band

The UE is not expected to transmit PUCCH/PUSCH/SRS on the union of restricted serving cell symbols due to measurement of all MOs, where the restricted serving cell symbols due to measurement of MO *i* include

- serving cell symbols fully or partially overlap with SSB symbols to be measured on MO *i*, and △t serving cell symbol before each consecutive SSB symbols to be measured and △t serving cell symbol after each consecutive SSB symbols to be measured within SMTC window duration, if *deriveSSB-IndexFromCellInter-r17* is enabled for MO *i*. △t is defined as the minimum integer number of symbols with total duration no smaller than the tolerance specified in clause 7.9.

- serving cell symbols fully or partially overlap with SMTC window for MO *i* and on 1 serving cell symbol before and after the SMTC window, if *deriveSSB-IndexFromCellInter-r17* is not enabled for MO *i*,

When the UE performs inter-frequency measurements with NCSG in a TDD band, the following restrictions apply due to SS-RSRQ measurement when *simultaneousRxTxInterBandCA* is not supported for the target measurement band and the serving cell band

The UE is not expected to transmit PUCCH/PUSCH/SRS on the union of restricted serving cell symbols due to measurement of all MOs, where the restricted serving cell symbols due to measurement of MO *i* include

- serving cell symbols fully or partially overlap with SSB symbols to be measured on MO *i*, and △t serving cell symbol before each consecutive SSB symbols to be measured and RSSI measurement symbols, and △t serving cell symbol after each consecutive SSB symbols to be measured and RSSI measurement symbols within SMTC window duration, if *deriveSSB-IndexFromCellInter-r17* is enabled for MO *i*. △t is defined as the minimum integer number of symbols with total duration no smaller than the tolerance specified in clause 7.9.

- serving cell symbols fully or partially overlap with SMTC window for MO *i* and on 1 serving cell symbol before and after the SMTC window, if *deriveSSB-IndexFromCellInter-r17* is not enabled for MO *i*.

If the high layer in TS 38.331 [2] signalling of *smtc2*is configured, the SMTC periodicityfollows *smtc2*; Otherwise SMTC periodicity follows *smtc1.*

When TDD intra-band carrier aggregation or TDD inter-band carrier aggregation without *simultaneousRxTxInterBandCA* support is performed, the scheduling restrictions due to a given serving cell should also apply to all other serving cells on the symbols that fully or partially overlap with the aforementioned restricted symbols.

When intra-band non-contiguous carrier aggregation is configured for a UE indicating [*intraBandNR-CA-non-collocated-r18*] and if [*nonCollocatedTypeNR-CA-r18*] is not provided, there are no scheduling restrictions on FR1 serving cell(s) to be measured and configured on the non-contiguous CC(s) in the same band. Otherwise, the scheduling restrictions due to a given serving cell should also apply to all other serving cells on the symbols that fully or partially overlap with the aforementioned restricted symbols if [*nonCollocatedTypeNR-CA-r18*] is provided.

When the UE performs inter-frequency measurements with NCSG in a TDD band and *simultaneousRxTxInterBandCA* is supported for the target measurement band and a serving cell’ band, no scheduling restriction applies to the serving cell.

##### 9.3.10.3.2 Scheduling availability of UE performing measurements with a different subcarrier spacing than PDSCH/PDCCH on FR1

For UE which do not support *simultaneousRxDataSSB-DiffNumerology* [14] the following restrictions apply due to SS-RSRP/RSRQ/SINR measurement when the target inter-frequency layer to be measured is on the same band with UE’s serving cell(s).

Editor’s note: FFS when target frequency layer to be measured is on the different band but with overlapped spectrum with UE’s serving cell(s)

- The UE is not expected to receive PDCCH/PDSCH/TRS/CSI-RS for CQI on the union of restricted serving cell symbols due to measurement of all MOs, where the restricted serving cell symbols due to measurement of MO *i* include

- serving cell symbols fully or partially overlap with SSB symbols to be measured on MO *i*, and △t serving cell symbol before each consecutive SSB symbols to be measured and △t serving cell symbol after each consecutive SSB symbols to be measured within SMTC window duration, if *deriveSSB-IndexFromCellInter-r17* is enabled for MO *i*. △t is defined as the minimum integer number of symbols with total duration no smaller than the tolerance specified in clause 7.9.

- serving cell symbols fully or partially overlap with SMTC window for MO *i* and on 1 serving cell symbol before and after the SMTC window, if *deriveSSB-IndexFromCellInter-r17* is not enabled for MO *i,*

If the high layer signalling of *smtc2*is configured in TS 38.331 [2], the SMTC periodicityfollows *smtc2*; Otherwise the SMTC periodicity follows *smtc1.*

When intra-band carrier aggregation is performed, the scheduling restrictions due to a given serving cell should also apply to all other serving cells in the same band on the symbols that fully or partially overlap with the aforementioned restricted symbols.

When intra-band non-contiguous carrier aggregation is configured for a UE indicating [*intraBandNR-CA-non-collocated-r18*] and if [*nonCollocatedTypeNR-CA-r18*] is not provided, there are no scheduling restrictions on FR1 serving cell(s) to be measured and configured on the non-contiguous CC(s) in the same band. Otherwise, the scheduling restrictions due to a given serving cell should also apply to all other serving cells in the same band on the symbols that fully or partially overlap with the aforementioned restricted symbols if [*nonCollocatedTypeNR-CA-r18*] is provided.

### <Unchanged Text Skipped>

#### 9.5.6.2 Scheduling availability of UE performing L1-RSRP measurement with a different subcarrier spacing than PDSCH/PDCCH on FR1

For UEs which support *simultaneousRxDataSSB-DiffNumerology* [14] there are no restrictions on scheduling availability due to L1-RSRP measurement based on SSB as RS for L1-RSRP measurement. For UEs which do not support *simultaneousRxDataSSB-DiffNumerology* [14] the following restrictions apply due to L1-RSRP measurement based on SSB configured for L1-RSRP measurement.

- The UE is not expected to transmit PUCCH/PUSCH/SRS or receive PDCCH/PDSCH/CSI-RS for tracking/CSI-RS for CQI on symbols corresponding to the SSB indexes configured for L1-RSRP measurement.

When intra-band carrier aggregation in FR1 is configured, the scheduling restrictions on serving cell where L1-RSRP measurement is performed apply to all serving cells in the same band on the symbols that fully or partially overlap with restricted symbols.

When intra-band non-contiguous carrier aggregation is configured for a UE indicating [*intraBandNR-CA-non-collocated-r18*] and if [*nonCollocatedTypeNR-CA-r18*] is not provided, there are no scheduling restrictions on FR1 serving cell(s) to be measured and configured on the non-contiguous CC(s) in the same band. Otherwise, the scheduling restrictions on serving cell where L1-RSRP measurement is performed apply to all serving cells in the same band on the symbols that fully or partially overlap with restricted symbols if [*nonCollocatedTypeNR-CA-r18*] is provided.

When inter-band carrier aggregation within FR1 is configured, there are no scheduling restrictions on FR1 serving cell(s) configured in other bands than the bands in which the serving cell where L1-RSRP measurement is performed is configured.

### <Unchanged Text Skipped>

#### 9.7.4.1 Scheduling availability of UE performing measurement on FR1

The following scheduling restriction applies due to CLI measurements.

- The UE is not expected to transmit PUCCH/PUSCH/SRS on OFDM symbols on which the UE performs CLI measurements, and on 1 data symbol before an OFDM symbol used for CLI measurements for 15 kHz and 30 kHz subcarrier spacing.

- For the UE which does not support *cli-SRS-RSRP-FDM\_DL*, the UE is not expected to receive PDCCH/PDSCH/CSI-RS for tracking/CSI-RS for CQI on OFDM symbols on which the UE performs SRS-RSRP measurements, and on 1 data symbol before an OFDM symbol used for SRS-RSRP measurements for 15 kHz and 30 kHz subcarrier spacing.

- For the UE which does not support *cli-RSSI-FDM-DL*, the UE is not expected to receive PDCCH/PDSCH/CSI-RS for tracking/CSI-RS for CQI on OFDM symbols on which the UE performs CLI-RSSI measurements, and on 1 data symbol before an OFDM symbol used for CLI-RSSI measurements for 15 kHz and 30 kHz subcarrier spacing.

- The UE is not expected to transmit PUCCH/PUSCH/SRS on OFDM symbols on which the UE performs CLI measurement, and on 2 data symbols before an OFDM symbol used for CLI measurements for 60 kHz subcarrier spacing.

- For the UE which does not support *cli-SRS-RSRP-FDM\_DL*, the UE is not expected to receive PDCCH/PDSCH/CSI-RS for tracking/CSI-RS for CQI on OFDM symbols on which the UE performs SRS-RSRP measurement, and on 2 data symbols before an OFDM symbol used for SRS-RSRP measurements for 60 kHz subcarrier spacing.

- For the UE which does not support *cli-RSSI-FDM-DL*, the UE is not expected to receive PDCCH/PDSCH/CSI-RS for tracking/CSI-RS for CQI on OFDM symbols on which the UE performs CLI-RSSI measurement, and on 2 data symbols before an OFDM symbol used for CLI-RSSI measurements for 60 kHz subcarrier spacing.

When TDD intra-band carrier aggregation is configured, the scheduling restrictions on serving cell where CLI measurements are performed apply on all serving cells in the same band on the symbols that fully or partially overlap with restricted symbols.

When intra-band non-contiguous carrier aggregation is configured for a UE indicating [*intraBandNR-CA-non-collocated-r18*] and if [*nonCollocatedTypeNR-CA-r18*] is not provided, there are no scheduling restrictions on FR1 serving cell(s) to be measured and configured on the non-contiguous CC(s) in the same band. Otherwise, the scheduling restrictions on serving cell where CLI measurements are performed apply on all serving cells in the same band on the symbols that fully or partially overlap with restricted symbols if [*nonCollocatedTypeNR-CA-r18*] is provided.

### <Unchanged Text Skipped>

#### 9.8.6.2 Scheduling availability of UE performing L1-SINR measurement with a different subcarrier spacing than PDSCH/PDCCH on FR1

For UEs which support *simultaneousRxDataSSB-DiffNumerology* [14] there are no restrictions on scheduling availability due to L1-SINR measurement based on SSB configured for L1-SINR measurement. For UEs which do not support *simultaneousRxDataSSB-DiffNumerology* [14] the following restrictions apply due to L1-SINR measurement based on SSB configured for L1-SINR measurement.

- The UE is not expected to transmit PUCCH/PUSCH/SRS or receive PDCCH/PDSCH/CSI-RS for tracking /CSI-RS for CQI on SSB symbols to be measured for L1-SINR measurement.

When intra-band carrier aggregation in FR1 is configured, the scheduling restrictions on serving cell where L1-SINR measurement is performed apply to all serving cells in the same band on the symbols that fully or partially overlap with restricted symbols.

When intra-band non-contiguous carrier aggregation is configured for a UE indicating [*intraBandNR-CA-non-collocated-r18*] and if [*nonCollocatedTypeNR-CA-r18*] is not provided, there are no scheduling restrictions on FR1 serving cell(s) to be measured and configured on the non-contiguous CC(s) in the same band. Otherwise, the scheduling restrictions on serving cell where L1-SINR measurement is performed apply to all serving cells in the same band on the symbols that fully or partially overlap with restricted symbols if [*nonCollocatedTypeNR-CA-r18*] is provided

When inter-band carrier aggregation within FR1 is configured, there are no scheduling restrictions on FR1 serving cell(s) configured in other bands than the bands in which the serving cell where L1-SINR measurement is performed is configured.

### <Unchanged Text Skipped>

#### 9.10.2.6 Scheduling availability of UE during CSI-RS based intra-frequency measurements

UE is required to be capable of measuring without measurement gaps when CSI-RS resources are completely contained in the active BWP of the UE. Note the configured CSI-RS symbol is indicated in *firstOFDMSymbolInTimeDomain* included in *CSI-RS-ResourceConfigMobility* for RRM. When UE is required to perform CSI-RS based RRM measurements, and any of the conditions in the following clauses is met, there are restrictions on the scheduling availability; otherwise, there is no scheduling restriction. Note same numerology for intra-frequency CSI-RS and data of serving cell is considered in this release.

##### 9.10.2.6.1 Scheduling availability of UE performing CSI-RS based measurements in TDD bands

When UE performs CSI-RS intra-frequency measurements in a TDD band,

- UE is not expected to transmit PUCCH/PUSCH/SRS on configured CSI-RS resource symbols, and on 1 OFDM symbol before and after each consecutively configured CSI-RS symbols.

When TDD intra-band carrier aggregation is performed, the scheduling restrictions due to a given serving cell should also apply to all other serving cells in the same band on the symbols that fully or partially overlap with the aforementioned restricted symbols.

When intra-band non-contiguous carrier aggregation is configured for a UE indicating [*intraBandNR-CA-non-collocated-r18*] and if [*nonCollocatedTypeNR-CA-r18*] is not provided, there are no scheduling restrictions on FR1 serving cell(s) configured on the non-contiguous CC(s) in the same band. Ohterwise, the scheduling restrictions due to a given serving cell should also apply to all other serving cells in the same band on the symbols that fully or partially overlap with the aforementioned restricted symbols if [*nonCollocatedTypeNR-CA-r18*] is provided.

### <Unchanged Text Skipped>

### 9.13.6 Scheduling availability of UE during L1-RSRP measurement

Scheduling availability restrictions described in the following clauses apply when UE is performing L1-RSRP measurement on cell(s) with PCI different from serving cell, and UE is receiving PDCCH/PDSCH from serving cell and/or cell(s) with different PCI.

#### 9.13.6.1 Scheduling availability of UE performing L1-RSRP measurement with a same subcarrier spacing as PDSCH/PDCCH on FR1

There are no scheduling restrictions due to L1-RSRP measurement performed on SSB as RS for L1-RSRP measurement with the same SCS as PDSCH/PDCCH in FR1.

#### 9.13.6.2 Scheduling availability of UE performing L1-RSRP measurement with a different subcarrier spacing than PDSCH/PDCCH on FR1

For UEs which support *simultaneousRxDataSSB-DiffNumerology* [14] there are no restrictions on scheduling availability due to L1-RSRP measurement based on SSB as RS for L1-RSRP measurement. For UEs which do not support *simultaneousRxDataSSB-DiffNumerology* [14] the following restrictions apply due to L1-RSRP measurement based on SSB configured for L1-RSRP measurement.

- The UE is not expected to transmit PUCCH/PUSCH/SRS or receive PDCCH/PDSCH/CSI-RS for tracking/CSI-RS for CQI on symbols corresponding to the SSB indexes configured for L1-RSRP measurement.

When intra-band carrier aggregation in FR1 is configured, the scheduling restrictions apply to cell(s) in the same band on the symbols that fully or partially overlap with restricted symbols.

When intra-band non-contiguous carrier aggregation is configured for a UE indicating [*intraBandNR-CA-non-collocated-r18*] and if [*nonCollocatedTypeNR-CA-r18*] is not provided, there are no scheduling restrictions on FR1 serving cell(s) to be measured and configured on the non-contiguous CC(s) in the same band. Otherwise, the scheduling restrictions apply to cell(s) in the same band on the symbols that fully or partially overlap with restricted symbols if [*nonCollocatedTypeNR-CA-r18*] is provided.

When inter-band carrier aggregation within FR1 is configured, there are no scheduling restrictions on FR1 cells configured in other bands than the bands in which the cell where L1-RSRP measurement is performed is configured.

### < End of Changes >