**3GPP TSG-RAN4 Meeting #** **109R4-2319245**

[Chicago](https://www.3gpp.org/Specification-Groups/), U.S.A., Nov. 13-17, 2023

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| *CR-Form-v12.2* |
| **CHANGE REQUEST** |
|  |
|  | **38.133** | **CR** | **3738** | **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 | **X** | Radio Access Network |  | Core Network |  |

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|  |
| ***Title:***  | Big CR to TS 38.133 on Dual TxRx Multi-SIM for NR |
|  |  |
| ***Source to WG:*** | vivo  |
| ***Source to TSG:*** | R4 |
|  |  |
| ***Work item code:*** | NR\_DualTxRx\_MUSIM-Core |  | ***Date:*** | 2023-10-30 |
|  |  |  |  |  |
| ***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 canbe found in 3GPP [TR 21.900](http://www.3gpp.org/ftp/Specs/html-info/21900.htm). | *Use one of the following releases:Rel-8 (Release 8)Rel-9 (Release 9)Rel-10 (Release 10)Rel-11 (Release 11)…Rel-16 (Release 16)Rel-17 (Release 17)Rel-18 (Release 18)Rel-19 (Release 19)* |
|  |  |
| ***Reason for change:*** | Big CR to capture all endorsed draft CRs for TS 38.133 under AI 5.25.2.The CR is for Endorsement. |
|  |  |
| ***Summary of change:*** | This CR includes contents of the following CRs endorsed in RAN4#108bis:R4-2317367 Draft CR on Rel-18 Intra-frequency measurement impact due to MUSIM gapR4-2317368 Draft CR on Rel-18 Inter-frequency measurement impact due to MUSIM gapR4-2317369 Draft CR on Rel-18 Inter-RAT measurement impact due to MUSIM gapR4-2317370 draftCR on NW A L1 measurement requirements with MUSIM gaps |
|  |  |
| ***Consequences if not approved:*** | RRM requirements for Dual Tx/Rx Multi-SIM for NR in Rel-18 is not complete. |
|  |  |
| ***Clauses affected:*** | 9.2.5, 9.2.69.3.4, 9.3.5, 9.3.99.4.2, 9.4.39.5.4.1, 9.5.4.2, 9.8.4.1, 9.13.4.1 |
|  |  |
|  | **Y** | **N** |  |  |
| ***Other specs*** |  | **X** |  Other core specifications  | TS/TR ... CR ...  |
| ***affected:*** | **X** |  |  Test specifications | TS 38.533  |
| ***(show related CRs)*** |  | **X** |  O&M Specifications | TS/TR ... CR ...  |
|  |  |
| ***Other comments:*** |  |
|  |  |
| ***This CR's revision history:*** |  |

**----------------------START OF CHANGE 1----------------------------**

### 9.2.5 Intrafrequency measurements without measurement gaps

#### 9.2.5.1 Intrafrequency cell identification

The UE shall be able to identify a new detectable intra-frequency cell within Tidentify\_intra\_without\_index if the UE is not indicated to report SSB based RRM measurement result with the associated SSB index(*reportQuantityRsIndexes* or *maxNrofRSIndexesToReport* is not configured), or the UE is indicated that the neighbour cell is synchronous with the serving cell (*deriveSSB-IndexFromCell* is enabled). Otherwise UE shall be able to identify a new detectable intra frequency cell within Tidentify\_intra\_with\_index. The UE shall be able to identify a new detectable intra frequency SS block of an already detected cell within Tidentify\_intra\_without\_index. It is assumed that *deriveSSB-IndexFromCell* is always enabled for FR1 TDD and FR2 with SCS smaller or equal to 480 kHz.

Tidentify\_intra\_without\_index = (TPSS/SSS\_sync\_intra + T SSB\_measurement\_period\_intra) ms

Tidentify\_intra\_with\_index = (TPSS/SSS\_sync\_intra + T SSB\_measurement\_period\_intra + TSSB\_time\_index\_intra) ms

Where:

 TPSS/SSS\_sync\_intra: it is the time period used in PSS/SSS detection given in table 9.2.5.1-1, 9.2.5.1-2, 9.2.5.1-4 (deactivated SCell) or 9.2.5.1-5 (deactivated SCell) or 9.2.5.1-9 (deactivated SCell) or 9.2.5.1-11 or 9.2.5.1-12 (deactivated PSCell) or 9.2.5.1-13 (deactivated PSCell).

- For UE supporting power class 6 with *highSpeedMeasFlagFR2-r17* configured, if SMTC <= 40ms, TPSS/SSS\_sync\_intra is given in Table 9.2.5.1-11; otherwise, TPSS/SSS\_sync\_intra is given in Table 9.2.5.1-2.

 TSSB\_time\_index\_intra: it is the time period used to acquire the index of the SSB being measured given in table 9.2.5.1-3, 9.2.5.1-15 (FR2-2), 9.2.5.1-6 (deactivated SCell), 9.2.5.1-10(deactivated SCell) or 9.2.5.1-14 (deactivated PSCell).

 T SSB\_measurement\_period\_intra: equal to a measurement period of SSB based measurement given in table 9.2.5.2-1, table 9.2.5.2-2 table 9.2.5.2-3 (deactivated SCell), 9.2.5.2-4(deactivated SCell), 9.2.5.2-5 or 9.2.5.2-6(deactivated SCell), 9.2.5.2-8(deactivated PSCell) or 9.2.5.2-9(deactivated PSCell).

- For UE supporting power class 6 with *highSpeedMeasFlagFR2-r17* configured, if SMTC <= 40ms, TSSB\_measurement\_period\_intra is given in Table 9.2.5.2-7; otherwise, T SSB\_measurement\_period\_intra is given in Table 9.2.5.2-2.

 CSSFintra: it is a carrier specific scaling factor and is determined

 according to CSSFoutside\_gap,i in clause 9.1.5.1 for measurement conducted outside measurement gaps, i.e. when intra-frequency SMTC is fully non overlapping or partially overlapping with measurement gaps or NCSG, or according to CSSFwithin\_gap,i in clause 9.1.5.2 for measurement conducted within measurement gaps, i.e. when intra-frequency SMTC is fully overlapping with measurement gaps, or according to CSSFwithin\_ncsg,i in clause 9.1.5.3 for measurement conducted within NCSG, i.e. when intra-frequency SMTC is fully overlapping with NCSG.

 For a UE that supports Pre-MG, an SMTC occasion is only considered to be overlapped by Pre-MG if the Pre-MG is activated.

 if the high layer in TS 38.331 [2] signalling of *smtc2* is configured, the assumed periodicity of intra-frequency SMTC occasions corresponds to the value of higher layer parameter *smtc2*; Otherwise the assumed periodicity of intra-frequency SMTC occasions corresponds to the value of higher layer parameter *smtc1*.

 Mpss/sss\_sync\_w/o\_gaps: For a UE supporting FR2-1 power class 1 or 5, Mpss/sss\_sync\_w/o\_gaps =40. For a UE supporting power class 2, Mpss/sss\_sync\_w/o\_gaps =24. For a UE supporting FR2-1 power class 3, Mpss/sss\_sync\_w/o\_gaps =24. For a UE supporting FR2-1 power class 4, Mpss/sss\_sync\_w/o\_gaps =24. For a UE supporting FR2-2 power class 1, Mpss/sss\_sync\_w/o\_gaps = 60. For a UE supporting FR2-2 power class 2, Mpss/sss\_sync\_w/o\_gaps = 36. For a UE supporting FR2-2 power class 3, Mpss/sss\_sync\_w/o\_gaps = 36.

 Mmeas\_period\_w/o\_gaps: For a UE supporting FR2-1 power class 1 or 5, Mmeas\_period\_w/o\_gaps =40. For a UE supporting FR2-1 power class 2, Mmeas\_period\_w/o\_gaps =24. For a UE supporting FR2-1 power class 3, Mmeas\_period\_w/o\_gaps =24. For a UE supporting power class 4, Mmeas\_period\_w/o\_gaps =24. For a UE supporting FR2-2 power class 1, Mmeas\_period\_w/o\_gaps = 60. For a UE supporting FR2-2 power class 2, Mmeas\_period\_w/o\_gaps = 36. For a UE supporting FR2-2 power class 3, Mmeas\_period\_w/o\_gaps = 36.

MSSB\_index\_intra: For a UE supporting FR2-2 power class 1, MSSB\_index\_intra = 72 samples. For a UE supporting FR2-2 power class 2, MSSB\_index\_intra = 48 samples. For a UE supporting FR2 power class 3, MSSB\_index\_intra = 48 samples.

When UE supports *concurrentMeasGap-r17* or *musim-GapPreference-r17* or both concurrent measurement gap and *musim-GapPreference-r17*, and concurrent measurement gaps or periodic MUSIM gaps or both concurrent gaps and periodic MUSIM gaps are configured

 Kp is the scaling factor for an SSB frequency layer to be measured without measurement gaps. Kp = Ntotal / Navailable, where Navailable and Ntotal are calculated as follows:

- For a window W of duration max(SMTC period, MGRP\_max), where MGRP max is the maximum MGRP across all configured per-UE measurement gap, periodic MUSIM gaps, and/or per-FR measurement gap within the same FR as the SSB frequency layer, and starting from the beginning of any SMTC occasion:

- Ntotal is the total number of SMTC occasions within the window, including those overlapped with measurement gap and MUSIM gap occasions within the window, and

- Navailable is the number of SMTC occasions that are not overlapped with any non-dropped MG or non-dropped MUSIM gap occasions within the window W, after accounting for measurement gap and MUSIM gap collisions by applying the collision rules for measurement gap and MUSIM gap in section 9.1.8.3 and 9.1.10.x3, respectively.

 Kp = 1 when Navailable = 0.

Requirements in this clause do not apply when Navailable = 0 due to fully overlapping between SMTC occasions and MUSIM gap occasions within the window W.

*Editor Note: FSS for the case when Navailable = 0 due to fully overlapping between SMTC occasions and the union of MUSIM gap and measurement gap occasions within the window W.*

When UE supports [*MUSIM-GapConfig-17]* and the SMTC occasion of the target frequency layer is overlapping with the configured aperiodic MUSIM gap, longer cell identification period for the target frequency layer is expected.

- Otherwise, when the UE is not configured with or UE does not support concurrent measurement gaps and the UE is not configured with periodic MUSIM gaps or UE does not support MUSIM gaps:

 When intra-frequency SMTC is fully non overlapping with measurement gaps or NCSG, or intra-frequency SMTC is fully overlapping with MGs or NCSG, Kp=1

 When intra-frequency SMTC is partially overlapping with measurement gaps, Kp = 1/(1- (SMTC period /MGRP)), where SMTC period < MGRP. When intra-frequency SMTC is partially overlapping with NCSG, Kp = 1/(1- (SMTC period /VIRP)), where SMTC period < VIRP. For calculation of Kp, if the high layer signalling (TS 38.331 [2]) of *smtc2* is configured, for cells indicated in the *pci-List* parameter in *smtc2*, the SMTC periodicity corresponds to the value of higher layer parameter *smtc2*; for the other cells, the SMTC periodicity corresponds to the value of higher layer parameter *smtc1.* If the higher layer signaling in TS38.331 [2] signalling of *smtc2* is present and smtc1 is fully overlapping with measurement gaps and smtc2 is partially overlapping with measurement gaps, requirements are not specified for Tidentify\_intra\_without\_index or Tidentify\_intra\_with\_index

 For FR2,

 Klayer1\_measurement=1,

- if all of the reference signals configured for RLM, BFD, CBD or L1-RSRP for beam reporting on any FR2 serving frequency in the same band outside measurement gap are not fully overlapped by intra-frequency SMTC occasions, or

- if all of the reference signal configured for RLM, BFD, CBD or L1-RSRP for beam reporting on any FR2 serving frequency in the same band outside measurement gap and fully-overlapped by intra-frequency SMTC occasions are not overlapped with any of the SSB symbols and the RSSI symbols, and 1 symbol before each consecutive SSB symbols and the RSSI symbols, and 1 symbol after each consecutive SSB symbols and the RSSI symbols, given that *SSB-ToMeasure* and *SS-RSSI-Measurement* are configured, where SSB symbols are indicated by the union set of SSB-ToMeasure from all the configured measurement objects on the same serving carrier which can be merged.and RSSI symbols are indicated by *SS-RSSI-Measurement*;

 Klayer1\_measurement=1.5, otherwise.

 If the above-mentioned reference signal configured for L1-RSRP measurement is aperiodic CSI-RS resource, longer cell identification delay would be expected.

 If MCG DRX is in use, cell identification requirements for intra-frequency measurement in MCG specified in Table 9.2.5.1-1, Table 9.2.5.1-2, Table 9.2.5.1-3, Table 9.2.5.1-4, Table 9.2.5.1-5 and Table 9.2.5.1-6 shall depend on the MCG DRX cycle. If SCG DRX is in use, cell identification requirements for intra-frequency measurement in SCG specified in Table 9.2.5.1-1, Table 9.2.5.1-2, Table 9.2.5.1-3, Table 9.2.5.1-4, Table 9.2.5.1-5, Table 9.2.5.1-6, Table 9.2.5.1-12, Table 9.2.5.1-13 and Table 9.2.5.1-14 shall depend on the SCG DRX cycle. Otherwise, the requirements for when DRX is not in use shall apply.

Table 9.2.5.1-1: Time period for PSS/SSS detection, (Frequency range FR1)

|  |  |
| --- | --- |
| DRX cycle | TPSS/SSS\_sync\_intra |
| No DRX | max( 600ms, ceil( 5 x Kp) x SMTC period )Note 1 x CSSFintra |
| DRX cycle≤ 320ms | max( 600ms, ceil(M2 Note 2x 5 x Kp) x max(SMTC period,DRX cycle)) x CSSFintra |
| DRX cycle>320ms | ceil(5 x Kp) x DRX cycle x CSSFintra |
| NOTE 1: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identifiedNOTE 2: When *highSpeedMeasFlag-r16* is not configured, M2 = 1.5; When *highSpeedMeasFlag-r16* is configured, M2 = 1.5 if SMTC periodicity > 40 ms;,otherwise M2=1.NOTE 3: When *highSpeedMeasFlag-r16* is configured, the requirements apply only to UE supporting either *measurementEnhancement-r16* or *intraNR-MeasurementEnhancement-r16* on measurements of the primary component carrier and do not apply to measurements of a secondary component carrier with active SCell.NOTE 4: When *highSpeedMeasCA-Scell-r17* is configured and UE supports *measurementEnhancementCA-r17*, M2 = 1.5 if SMTC periodicity > 40 ms; otherwise M2=1. |

Table 9.2.5.1-2: Time period for PSS/SSS detection, (Frequency range FR2)

|  |  |
| --- | --- |
| DRX cycle | TPSS/SSS\_sync\_intra |
| No DRX | max(600ms, ceil(Mpss/sss\_sync\_w/o\_gaps x KFR x Kp x Klayer1\_measurement)x SMTC period)Note 1 x CSSFintra |
| DRX cycle≤ 320ms | max(600ms, ceil(1.5 x Mpss/sss\_sync\_w/o\_gaps x KFR x Kp x Klayer1\_measurement)x max(SMTC period,DRX cycle)) x CSSFintra |
| DRX cycle>320ms | ceil(Mpss/sss\_sync\_w/o\_gaps x KFR x Kp x Klayer1\_measurement) x DRX cycle x CSSFintra |
| NOTE 1: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identifiedNOTE 2: KFR is a scaling factor depending on the frequency range and the SSB SCS. For FR2-1, KFR = 1. For FR2-2: KFR = 1 if the SCS of the SSB of the cell being detected is 120 kHz, KFR = 2 if the SCS of the SSB of the cell being detected is 480 kHz, and KFR = 3 if the SCS of the SSB of the cell being detected is 960 kHz. |

Table 9.2.5.1-3: Time period for time index detection (FR1)

|  |  |
| --- | --- |
| DRX cycle | TSSB\_time\_index\_intra |
| No DRX | max(120ms, ceil( 3 x Kp )x SMTC period)Note 1 x CSSFintra |
| DRX cycle≤ 320ms | max(120ms, ceil (M2 Note 2 x 3 x Kp) x max(SMTC period,DRX cycle)) x CSSFintra |
| DRX cycle>320ms | Ceil(3 x Kp) x DRX cycle x CSSFintra |
| NOTE 1: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identifiedNOTE 2: When *highSpeedMeasFlag-r16* is not configured, M2 = 1.5; When *highSpeedMeasFlag-r16* is configured, M2 = 1.5 if SMTC periodicity > 40 ms;,otherwise M2=1NOTE 3: When *highSpeedMeasFlag-r16* is configured, the requirements apply only to UE supporting either *measurementEnhancement-r16* or *intraNR-MeasurementEnhancement-r16* on measurements of the primary component carrier and do not apply to measurements of a secondary component carrier with active SCell.NOTE 4: When *highSpeedMeasCA-Scell-r17* is configured and UE supports *measurementEnhancementCA-r17*, M2 = 1.5 if SMTC periodicity > 40 ms; otherwise M2=1 |

Table 9.2.5.1-4: Time period for PSS/SSS detection, deactivated SCell (FR1)

|  |  |
| --- | --- |
| DRX cycle | TPSS/SSS\_sync\_intra |
| No DRX | Ceil(5 x Kp) x measCycleSCell x CSSFintra |
| DRX cycle≤ 320ms | Ceil(5 x Kp) x max(measCycleSCell, 1.5xDRX cycle) x CSSFintra |
| DRX cycle> 320ms | Ceil(5 x Kp) x max(measCycleSCell, DRX cycle) x CSSFintra |
| NOTE 1: The requirements also apply to deactivated SCG SCell. |

Table 9.2.5.1-5: Time period for PSS/SSS detection, deactivated SCell (FR2)

|  |  |
| --- | --- |
| DRX cycle | TPSS/SSS\_sync\_intra |
| No DRX | Ceil(Mpss/sss\_sync\_w/o\_gaps x Kp) x measCycleSCell x CSSFintra |
| DRX cycle≤ 320ms | Ceil(Mpss/sss\_sync\_w/o\_gaps x Kp) x max(measCycleSCell, 1.5xDRX cycle) x CSSFintra |
| DRX cycle> 320ms | Ceil(Mpss/sss\_sync\_w/o\_gaps x Kp) x max(measCycleSCell, DRX cycle) x CSSFintra |
| NOTE 1: The requirements also apply to deactivated SCG SCell. |

Table 9.2.5.1-6: Time period for time index detection, deactivated SCell (FR1)

|  |  |
| --- | --- |
| DRX cycle | TSSB\_time\_index\_intra |
| No DRX | Ceil(3 x Kp) x measCycleSCell x CSSFintra |
| DRX cycle≤ 320ms | Ceil(3 x Kp) x max(measCycleSCell, 1.5xDRX cycle) x CSSFintra |
| DRX cycle> 320ms | Ceil(3 x Kp) x max(measCycleSCell, DRX cycle) x CSSFintra |
| NOTE 1: The requirements also apply to deactivated SCG SCell. |

Table 9.2.5.1-7: Void

Table 9.2.5.1-8: Void

Table 9.2.5.1-9: Time period for PSS/SSS detection, deactivated SCell (FR1), when *highSpeedMeasCA-Scell-r17* is configured

|  |  |
| --- | --- |
| DRX cycle | TPSS/SSS\_sync\_intra |
| No DRX | Ceil(5 x Kp) x measCycleSCell x CSSFintra |
| DRX cycle≤ 320ms |  Ceil(5 x Kp) x max(measCycleSCell, M2 Note 1xDRX cycle) x CSSFintra |
| DRX cycle> 320ms | Ceil(5 x Kp) x max(measCycleSCell, DRX cycle) x CSSFintra |
| NOTE 1: M2 = 1.5 if SMTC periodicity > 40 ms; otherwise M2=1 |

Table 9.2.5.1-10: Time period for time index detection, deactivated SCell (FR1)，when *highSpeedMeasCA-Scell-r17* is configured

|  |  |
| --- | --- |
| DRX cycle | TSSB\_time\_index\_intra |
| No DRX | Ceil(3 x Kp) x measCycleSCell x CSSFintra |
| DRX cycle≤ 320ms |  Ceil(3 x Kp) x max(measCycleSCell, M2 Note 1xDRX cycle) x CSSFintra |
| DRX cycle> 320ms | Ceil(3 x Kp)x max(measCycleSCell, DRX cycle) x CSSFintra |
| NOTE 1: M2 = 1.5 if SMTC periodicity > 40 ms; otherwise M2=1 |

Table 9.2.5.1-11: Time period for PSS/SSS detection when *highSpeedMeasFlagFR2-r17* is configured, (Frequency range FR2) when SMTC period <= 40ms

|  |  |
| --- | --- |
| DRX cycle | TPSS/SSS\_sync\_intra |
| No DRX | max(600ms, ceil(M1Note 2 x Kp x Klayer1\_measurement)x SMTC period)Note 1 x CSSFintra |
| DRX cycle≤ 80ms | max(600ms, ceil(M1Note 2 x Kp x Klayer1\_measurement)x max(SMTC period,DRX cycle)) x CSSFintra |
| 80ms< DRX cycle≤ 320ms | ceil(1.5x Mpss/sss\_sync\_w/o\_gaps Note 3 x Kp x Klayer1\_measurement)x max(SMTC period,DRX cycle) x CSSFintra |
| DRX cycle>320ms | ceil(Mpss/sss\_sync\_w/o\_gaps Note 3 x Kp x Klayer1\_measurement) x DRX cycle x CSSFintra |
| NOTE 1: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identifiedNOTE 2: For UE supporting power class 6, M1= 6 if *highSpeedMeasFlagFR2-r17* = set1 or M1= 18 if *highSpeedMeasFlagFR2-r17* = set2NOTE 3: Void |

Table 9.2.5.1-12: Time period for PSS/SSS detection, deactivated PSCell (FR1)

|  |  |
| --- | --- |
| DRX cycle | TPSS/SSS\_sync\_intra |
| No DRX | Ceil(5 x Kp) x measCyclePSCell x CSSFintra |
| DRX cycle≤ 320ms | Ceil(5 x Kp) x max(measCyclePSCell, 1.5xDRX cycle) x CSSFintra |
| DRX cycle> 320ms | Ceil(5 x Kp) x max(measCyclePSCell, DRX cycle) x CSSFintra |

Table 9.2.5.1-13: Time period for PSS/SSS detection, deactivated PSCell (FR2)

|  |  |
| --- | --- |
| DRX cycle | TPSS/SSS\_sync\_intra |
| No DRX | Ceil(Mpss/sss\_sync\_w/o\_gaps x Kp) x measCyclePSCell x CSSFintra |
| DRX cycle≤ 320ms | Ceil(Mpss/sss\_sync\_w/o\_gaps x Kp) x max(measCyclePSCell, 1.5xDRX cycle) x CSSFintra |
| DRX cycle> 320ms | Ceil(Mpss/sss\_sync\_w/o\_gaps x Kp) x max(measCyclePSCell, DRX cycle) x CSSFintra |

Table 9.2.5.1-14: Time period for time index detection, deactivated PSCell (FR1)

|  |  |
| --- | --- |
| DRX cycle | TSSB\_time\_index\_intra |
| No DRX | Ceil(3 x Kp) x measCyclePSCell x CSSFintra |
| DRX cycle≤ 320ms | Ceil(3 x Kp) x max(measCyclePSCell, 1.5xDRX cycle) x CSSFintra |
| DRX cycle> 320ms | Ceil(3 x Kp) x max(measCyclePSCell, DRX cycle) x CSSFintra |

Table 9.2.5.1-15: Time period for time index detection (Frequency range FR2-2)

|  |  |
| --- | --- |
| DRX cycle | TSSB\_time\_index\_intra |
| No DRX | max(200ms, ceil(MSSB\_index\_intra x Kp x SMTC period) x CSSFintra |
| DRX cycle≤ 320ms | max(200ms, ceil(1.5 x MSSB\_index\_intra x Kp) x max(SMTC period, DRX cycle) x CSSFintra) |
| DRX cycle>320ms | Ceil(MSSB\_index\_intra x Kp )x DRX cycle x CSSFintra |

#### 9.2.5.2 Measurement period

The measurement period for intra-frequency measurements without gaps is as shown in table 9.2.5.2-1, 9.2.5.2-2, 9.2.5.2-3 (deactivated SCell), 9.2.5.2-4 (deactivated SCell), 9.2.5.2-8 (deactivated SCG applicable for PSCell) or 9.2.5.2-9 (deactivated SCG applicable for PSCell). When *highSpeedMeasFlag-r16* is configured, T SSB\_measurement\_period\_intra is specified in Table 9.2.5.2-5.

If the higher layer signaling in TS38.331 [2] signalling of *smtc2* is present and smtc1 is fully overlapping with measurement gaps and smtc2 is partially overlapping with measurement gaps, requirements are not specified for TSSB\_measurement\_period\_intra

For a UE that supports Pre-MG, an SMTC occasion is only considered to be overlapped by Pre-MG if the Pre-MG is activated.

If MCG DRX is in use, measurement period requirements for intra-frequency measurement in MCG specified in Table 9.2.5.2-1, Table 9.2.5.2-2, Table 9.2.5.2-3 and Table 9.2.5.2-4 shall depend on the MCG DRX cycle. If SCG DRX is in use, measurement period requirements for intra-frequency measurement in SCG specified in Table 9.2.5.2-1, Table 9.2.5.2-2, Table 9.2.5.2-3, Table 9.2.5.2-4, Table 9.2.5.2-8 and Table 9.2.5.2-9, shall depend on the SCG DRX cycle. Otherwise, the requirements for when DRX is not in use shall apply.

For FR2, a longer measurement period is allowed, if aperiodic CSI-RS resource is measured for L1-RSRP measurement on any FR2 serving frequency in the same band, and the CSI-RS resource is outside measurement gap and overlapped with any of the SSB symbols and the RSSI symbols, and 1 symbol before each consecutive SSB symbols and the RSSI symbols, and 1 symbol after each consecutive SSB symbols and the RSSI symbols. If *SSB-ToMeasure* or *SS-RSSI-Measurement* is configured, the SSB symbols are indicated by the union set of *SSB-ToMeasure* from all the configured measurement objects on the same band which can be merged and the RSSI symbols are indicated by *SS-RSSI-Measurement*.

Table 9.2.5.2-1: Measurement period for intra-frequency measurements without gaps (FR1)

|  |  |
| --- | --- |
| DRX cycle | T SSB\_measurement\_period\_intra  |
| No DRX | max(200ms, ceil( 5 x Kp) x SMTC period)Note 1 x CSSFintra |
| DRX cycle≤ 320ms | max(200ms, ceil(1.5x 5 x Kp) x max(SMTC period,DRX cycle)) x CSSFintra |
| DRX cycle>320ms | ceil( 5 x Kp ) x DRX cycle x CSSFintra |
| NOTE 1: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identified |

Table 9.2.5.2-2: Measurement period for intra-frequency measurements without gaps (FR2)

|  |  |
| --- | --- |
| DRX cycle | T SSB\_measurement\_period\_intra  |
| No DRX | max(400ms, ceil(Mmeas\_period\_w/o\_gaps x Kp x Klayer1\_measurement) x SMTC period)Note 1 x CSSFintra |
| DRX cycle≤ 320ms | max(400ms, ceil(1.5x Mmeas\_period\_w/o\_gaps x Kp x Klayer1\_measurement) x max(SMTC period,DRX cycle)) x CSSFintra  |
| DRX cycle>320ms | ceil(Mmeas\_period\_w/o\_gaps xKp x Klayer1\_measurement ) x DRX cycle x CSSFintra |
| NOTE 1: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identified |

Table 9.2.5.2-3: Measurement period for intra-frequency measurements without gaps (deactivated SCell) (FR1)

|  |  |
| --- | --- |
| DRX cycle | T SSB\_measurement\_period\_intra  |
| No DRX | Ceil(5 x Kp) x measCycleSCell x CSSFintra |
| DRX cycle≤ 320ms | Ceil(5 x Kp) x max(measCycleSCell, 1.5xDRX cycle) x CSSFintra |
| DRX cycle> 320ms | Ceil(5 x Kp) x max(measCycleSCell, DRX cycle) x CSSFintra |
| NOTE 1: The requirements also apply to deactivated SCG SCel |

Table 9.2.5.2-4: Measurement period for intra-frequency measurements without gaps (deactivated SCell) (FR2)

|  |  |
| --- | --- |
| DRX cycle | T SSB\_measurement\_period\_intra  |
| No DRX | Ceil(Mmeas\_period\_w/o\_gaps x Kp) x measCycleSCell x CSSFintra |
| DRX cycle≤ 320ms | Ceil(Mmeas\_period\_w/o\_gaps x Kp) x max(measCycleSCell, 1.5xDRX cycle) x CSSFintra |
| DRX cycle> 320ms | Ceil(Mmeas\_period\_w/o\_gaps x Kp) x max(measCycleSCell, DRX cycle) x CSSFintra |
| NOTE 1: The requirements also apply to deactivated SCG SCell. |

Table 9.2.5.2-5: T SSB\_measurement\_period\_intra When *highSpeedMeasFlag-r16* and/or highSpeedMeasCA-Scell-r17 is configured (Frequency range FR1

|  |  |
| --- | --- |
| DRX cycle | T SSB\_measurement\_period\_intra  |
| No DRX Note 2 | max(200ms, ceil( 5 x Kp) x SMTC period)Note 1 x CSSFintra |
| DRX cycle≤ 160ms | max(200ms, ceil(5 x M2 Note 2 x Kp) x max(SMTC period,DRX cycle)) x CSSFintra |
| 160ms < DRX cycle≤ 320ms | ceil(4 x M2 Note 2 x Kp) x DRX cycle x CSSFintra |
| DRX cycle>320ms | ceil( Y Note 3 x Kp ) x DRX cycle x CSSFintra |
| NOTE 1: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identifiedNOTE 2: M2 = 1.5 if SMTC period > 40 ms, otherwise M2=1NOTE 3: Y=3 when SMTC period <= 40ms, Y=5 when SMTC period > 40msNOTE 4: When *highSpeedMeasFlag-r16* is configured, the requirements apply only to UE supporting either *measurementEnhancement-r16* or *intraNR-MeasurementEnhancement-r16* on measurements of the primary component carrier and do not apply to measurements of a secondary component carrier with active SCell.NOTE 5: When highSpeedMeasCA-Scell-r17 is configured, the requirements apply to measurements of secondary component carrier with active SCell. |

Table 9.2.5.2-6: Measurement period for intra-frequency measurements without gaps (deactivated SCell) (FR1), when highSpeedMeasCA-Scell-r17 is configured

|  |  |
| --- | --- |
| DRX cycle | T SSB\_measurement\_period\_intra  |
| No DRX | ceil( 5 x Kp) x measCycleSCell x CSSFintra |
| DRX cycle≤ 160ms | ceil(5 x Kp) x max(measCycleSCell, M2 Note 1 x DRX cycle) x CSSFintra |
| 160ms < DRX cycle≤ 320ms | ceil(4 x Kp) x max(measCycleSCell, M2 Note 1 x DRX cycle) |
| DRX cycle>320ms | ceil( Y Note 2 x Kp ) x max(measCycleSCell, DRX cycle) x CSSFintra |
| NOTE 1: M2 = 1.5 if SMTC periodicity > 40 ms, otherwise M2=1NOTE 2: Y=3 when SMTC <= 40ms, Y=5 when SMTC > 40ms |

Table 9.2.5.2-7: Measurement period for intra-frequency measurements without gaps when *highSpeedMeasFlagFR2-r17* is configured (FR2) when SMTC period <= 40ms

|  |  |
| --- | --- |
| DRX cycle | T SSB\_measurement\_period\_intra  |
| No DRX | max(400ms, ceil(M1Note 2 x Kp x Klayer1\_measurement) x SMTC period)Note 1 x CSSFintra |
| DRX cycle≤ 80ms | max(400ms, ceil(M1Note 2 x Kp x Klayer1\_measurement) x max(SMTC period,DRX cycle)) x CSSFintra |
| 80ms< DRX cycle≤ 320ms | ceil(1.5x Mmeas\_period\_w/o\_gaps Note 3 x Kp x Klayer1\_measurement) x max(SMTC period,DRX cycle) x CSSFintra  |
| DRX cycle>320ms | ceil(Mmeas\_period\_w/o\_gaps Note 3 xKp x Klayer1\_measurement ) x DRX cycle x CSSFintra |
| NOTE 1: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identifiedNOTE 2: For UE supporting power class 6, M1= 6 if *highSpeedMeasFlagFR2-r17* = set1 or M1= 18 if *highSpeedMeasFlagFR2-r17* = set2 |

Table 9.2.5.2-8 Measurement period for intra-frequency measurements without gaps (deactivated SCG applicable for PSCell) (FR1)

|  |  |
| --- | --- |
| DRX cycle | T SSB\_measurement\_period\_intra  |
| No DRX | Ceil(5 x Kp) x measCyclePSCell x CSSFintra |
| DRX cycle≤ 320ms | Ceil(5 x Kp) x max(measCyclePSCell, 1.5xDRX cycle) x CSSFintra |
| DRX cycle> 320ms | Ceil(5 x Kp) x max(measCyclePSCell, DRX cycle) x CSSFintra |

**Table 9.2.5.2-9: Measurement period for intra-frequency measurements without gaps (deactivated SCG applicable for PSCell) (FR2)**

|  |  |
| --- | --- |
| DRX cycle | T SSB\_measurement\_period\_intra  |
| No DRX | Ceil(Mmeas\_period\_w/o\_gaps x Kp) x measCyclePSCell x CSSFintra |
| DRX cycle≤ 320ms | Ceil(Mmeas\_period\_w/o\_gaps x Kp) x max(measCyclePSCell, 1.5xDRX cycle) x CSSFintra |
| DRX cycle> 320ms | Ceil(Mmeas\_period\_w/o\_gaps x Kp) x max(measCyclePSCell, DRX cycle) x CSSFintra |

#### 9.2.5.3 Scheduling availability of UE during intra-frequency measurements

UE shall be capable of measuring without measurement gaps when the SSB is completely contained in the active bandwidth part of the UE. When any of the conditions in the following clauses is met, there are restrictions on the scheduling availability; otherwise, there is no scheduling restriction. Note that the SSB symbols indicated by the union set of SSB-ToMeasure from all the configured measurement objects on the same serving carrier which can be merged[2], if it is configured; otherwise, all *L* SSB symbols within the SMTC window duration defined in clause 4.1 of TS 38.213 [3] are included.

For a UE that supports Pre-MG, the requirements in 9.2.5.3 also apply when a Pre-MG is deactivated.

For UE supporting concurrent measurement gaps, when concurrent gaps are configured, the requirements in 9.2.5.3 are also applied to the slots that are not interrupted according to requirements in clause 9.1.X2.3.

[For UE supporting MUSIM gaps, when MUSIM gaps are configured, the requirements in 9.2.5.3 are also applied to the slots that are not interrupted according to requirements in clause 9.1.10.x3.y2 and 9.1.10.x3.y3.]

##### 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 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.

##### 9.2.5.3.3 Scheduling availability of UE performing measurements on FR2

The following scheduling restriction applies due to SS-RSRP or SS-SINR measurement on an FR2 intra-frequency cell

- 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 K data symbol(s) before each consecutive SSB symbols to be measured and K data symbol(s) after each consecutive SSB symbols to be measured within SMTC window duration.

- If *deriveSSB-IndexFromCell* is not enabled and the SCS of data and SSB symbols are smaller than 960kHz, 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 *deriveSSB-IndexFromCell* is not enabled and the SCS of data or SSB symbols is 960kHz, the UE is not expected to transmit PUCCH/PUSCH/SRS or receive PDCCH/PDSCH/TRS/CSI-RS for CQI SSB symbols to be measured, and on K’ data symbol(s) before each consecutive SSB symbols to be measured and K’ data symbol(s) after each consecutive SSB symbols to be measured within SMTC window duration.

The following scheduling restriction applies to SS-RSRQ measurement on an FR2 intra-frequency cell

- 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, RSSI measurement symbols, and on K data symbol(s) before each consecutive SSB to be measured/RSSI symbols and K data symbol(s) after each consecutive SSB to be measured/RSSI symbols within SMTC window duration

*-* If *deriveSSB-IndexFromCell* is not enabled and the SCS of data and SSB symbols are smaller than 960kHz, 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 *deriveSSB-IndexFromCell* is not enabled and the SCS of SSB symbols is 960kHz, 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, RSSI measurement symbols, and on K’ data symbol(s) before each consecutive SSB to be measured/RSSI symbols and K’ data symbol(s) after each consecutive SSB to be measured/RSSI symbols within SMTC window duration.

where

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

- The signaling *deriveSSB-IndexFromCell* is always enabled for FR2-1 and FR2-2 when SSB is using 120 kHz SCS and 480 kHz SCS.

- K=1 for a serving cell with data symbols of 120 kHz SCS

- K=4 for a serving cell with data symbols of 480 kHz SCS and SSB symbols of 120kHz or 480kHz SCS

- K=3 for a serving cell with data symbols of 480 kHz SCS and SSB symbols of 960kHz SCS

- K=7 for a serving cell with data symbols of 960 kHz SCS and SSB symbols of 120kHz or 480kHz SCS

- K=4 for a serving cell with data symbols of 960 kHz SCS and SSB symbols of 960kHz SCS

- K’=[2] for a serving cell with data symbols of 120 kHz SCS and SSB symbols of 960kHz SCS

- K’=[4] for a serving cell with data symbols of 480 kHz SCS and SSB symbols of 960kHz SCS

- K’=[7] for a serving cell with data symbols of 960 kHz SCS and SSB symbols of 960kHz SCS

When intra-band carrier aggregation in FR2 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 inter-band carrier aggregation in FR2 is performed, there are no scheduling restrictions on FR2 serving cells in the bands due to SS-RSRP, SS-RSRQ or SS-SINR measurement on an FR2 intra-frequency cell in different bands, provided that UE is capable of independent beam management on this FR2 band pair. Additionally, there is no scheduling restriction if the UE is configured with different numerology between SSB on one FR2 band and data on the other FR2 band provided the UE is configured for IBM operation for the band pair.

Note: When inter-band carrier aggregation in FR2 is performed, the scheduling restrictions as defined in clause 9.2.5.3.1 due to a given serving cell should also apply to another serving cell in a different FR2 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 FR2 band pair.

If 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

For the SSB and CORESET for RMSI scheduling multiplexing patterns 3, the UE is expected to receive the PDCCH that the UE monitors in the Type0-PDCCH CSS set, and the corresponding PDSCH, on SSB symbols to be measured; and

For the SSB and CORESET for RMSI scheduling multiplexing patterns 2, the UE is expected to receive PDSCH that corresponds to the PDCCH that the UE monitors in the Type0-PDCCH CSS set, on SSB symbols to be measured.

##### 9.2.5.3.4 Scheduling availability of UE performing measurements on FR1 or FR2 in case of FR1-FR2 inter-band CA

There are no scheduling restrictions on FR1 serving cell(s) due to measurements performed on FR2 serving cell frequency layer. However, the scheduling restrictions as defined in clause 9.2.5.3.1 due to a given serving cell in FR2 should also apply to another serving cell in an FR1 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 FR1-FR2 band pair.

There are no scheduling restrictions on FR2 serving cell(s) due to measurements performed on FR1 serving cell frequency layer. However, the scheduling restrictions as defined in clause 9.2.5.3.1 due to a given serving cell in FR1 should also apply to another serving cell in an FR2 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 FR1-FR2 band pair.

#### 9.2.5.4 SFTD Measurements between PCell and PSCell

##### 9.2.5.4.1 Introduction

This clause contains SFTD measurement requirements for UE which supports NR-DC and is configured with a PSCell in RRC\_CONNECTED state. The UE shall perform SFTD measurement between PCell and PSCell, and report the SFTD result with/without SS-RSRP after the network requests with *reportType* for the associated *reportConfig* set to *reportSFTD*. The overall delay includes RRC procedure delay defined in clause 12 in TS 38.331 [2], and SFTD measurement reporting delay in clause 9.2.5.4.3..

##### 9.2.5.4.2 SFTD Measurement delay

When no DRX is used in either of PCell and PSCell, the physical layer measurement period of the SFTD measurement shall be Tmeasure\_SFTD1 = max(200, 5 x SMTC period) ms, where the SMTC period refers to the maximum between the configured SMTC period in PCell and PSCell.

When DRX is used in either of the PCell or the PSCell, or in both PCell and PSCell, the physical layer measurement period (Tmeasure\_SFTD1) of the SFTD measurement shall be as specified in Table 9.2.5.4.2-1.

Table 9.2.5.4.2-1: SFTD measurement requirement when DRX is used

|  |  |
| --- | --- |
| DRX cycle length (s) Note 3 | Tmeasure\_SFTD1 (s) |
| ≤0.04 | max(0.2, 5 x SMTC period) (Note2) |
| 0.04<DRX cycle≤0.32 | 8 x max(DRX cycle, SMTC period) |
| 0.32<DRX cycle≤10.24 | 5 x DRX cycle |
| Note 1: SMTC period in this table refers to the maximum between the configured SMTC period in PCell and PSCell. Note 2: Number of DRX cycles depends upon the DRX cycle in useNote 3: DRX cycle length in this table refers to the DRX cycle length configured for PCell or PSCell. When DRX is used in both PCell and PSCell, DRX cycle length in this table refers to the longer of the DRX cycle lengths for PCell and PSCell. |

If PSCell is changed without changing carrier frequency of PSCell, while the UE is performing SFTD measurements, the UE shall still meet SFTD measurement and accuracy requirements for the new PSCell. In this case the UE shall restart the SFTD measurement, and the total physical layer measurement period shall not exceed Tmeasure\_SFTD2 as defined by the following expression:

Tmeasure\_SFTD2 = (M+1)\*(Tmeasure\_SFTD1) + M\*TPSCell\_change\_NRDC

where:

 M is the number of times the NR PSCell is changed over the measurement period (Tmeasure\_SFTD2), and

 TPSCell\_change\_NRDC is the time necessary to change the PSCell; it can be up to 25ms.

If PCell is changed, or if PSCell is changed with different carrier frequency from PSCell, the UE shall terminate SFTD measurements.

The measurement accuracy for the SFTD measurement when DRX is used as well as when no DRX is used shall be as specified in the clause 10.1.21.

##### 9.2.5.4.3 SFTD Measurement Reporting Delay

The SFTD measurement reporting delay is defined as the time between a command that will trigger an SFTD measurement report and the point when the UE starts to transmit the measurement report over the air interface. This requirement assumes that the measurement report is not delayed by other RRC signalling on the DCCH. This measurement reporting delay excludes a delay uncertainty resulted when inserting the measurement report to the TTI of the uplink DCCH. The delay uncertainty is: 2 x TTIDCCH. This measurement reporting delay excludes any delay caused by no UL resources available for UE to send the measurement report.

The SFTD measurement reporting delay shall be less than measurement period defined in clause 9.2.5.4.2 plus the RRC procedure delay defined in TS 38.331 [2].

### 9.2.6 Intra-frequency measurements with measurement gaps

#### 9.2.6.1 Void

#### 9.2.6.2 Intra-frequency cell identification

When a measurement gap is provided or an activated Pre-MG is provided without any pre-MG status changed during the measurement period, the UE shall be able to identify a new detectable intra frequency cell within Tidentify\_intra\_without\_index if UE is not indicated to report SSB based RRM measurement result with the associated SSB index (*reportQuantityRsIndexes* or *maxNrofRSIndexesToReport* is not configured), or the UE has been indicated that the neighbour cell is synchronous with the serving cell (*deriveSSB-IndexFromCell* is enabled). Otherwise UE shall be able to identify a new detectable intra frequency cell within Tidentify\_intra\_with\_index. The UE shall be able to identify a new detectable intra frequency SS block of an already detected cell within Tidentify\_intra\_without\_index. It is assumed that *deriveSSB-IndexFromCell* is always enabled for FR1 TDD and FR2 with SCS smaller or equal to 480 kHz.

 Tidentify\_intra\_without\_index = TPSS/SSS\_sync\_intra + T SSB\_measurement\_period\_intra ms

 Tidentify\_intra\_with\_index = TPSS/SSS\_sync\_ntra + T SSB\_measurement\_period\_intra + TSSB\_time\_index\_intra ms

Where:

 TPSS/SSS\_sync\_intra: it is the time period used in PSS/SSS detection given in table 9.2.6.2-1, 9.2.6.2-2 or 9.2.6.2-9.

- For UE supporting power class 6 with *highSpeedMeasFlagFR2-r17* configured, if SMTC <= 40ms, TPSS/SSS\_sync\_intra is given in Table 9.2.6.2-9; otherwise, TPSS/SSS\_sync\_intra is given in Table 9.2.6.2-2.

 TSSB\_time\_index\_intra: it is the time period used to acquire the index of the SSB being measured given in table 9.2.6.2-3 or 9.2.6.2-10 (for FR2-2).

 T SSB\_measurement\_period\_intra: equal to a measurement period of SSB based measurement given in table 9.2.6.3-1 or 9.2.6.3-2.

- For UE supporting power class 6 with *highSpeedMeasFlagFR2-r17* configured, if SMTC <= 40ms, TSSB\_measurement\_period\_intra is given in Table 9.2.6.3-4; otherwise, T SSB\_measurement\_period\_intra is given in Table 9.2.6.3-2.

 CSSFintra: it is a carrier specific scaling factor and is determined according to CSSFwithin\_gap,i in clause 9.1.5.2 for measurement conducted within measurement gaps.

 Kgap is the scaling factor for a SSB frequency layer to be measured within an associated measurement gap pattern. Kgap = 1 when the UE is not configured with or the UE does not support concurrent measurement gaps or MUSIM gaps. Otherwise, Kgap = Ntotal / Navailable, where Navailable and Ntotal are calculated as follows:

 For a window W of duration max(SMTC period, MGRP\_max), where MGRP max is the maximum MGRP across all configured per-UE measurement gap, periodic MUSIM gaps, and per-FR measurement gap within the same FR as the SSB frequency layer, and starting from the beginning of any SMTC occasion:

-- Ntotal is the total number of SMTC occasions that are covered by instances of the associated measurement gap within the window W, including those overlapped with other measurement gap and MUSIM gap occasions within the window, and

 Navailable is the number of SMTC occasions that are covered by instances of the non-dropped associated measurement gap within the window W after accounting for measurement gap and MUSIM gap collisions by applying the collision rules for measurement gap and MUSIM gap in section 9.1.8.3 and 9.1.10.x3, respectively.

Requirements in this clause do not apply if Navailable =0.

When UE supports [*MUSIM-GapConfig-17*] and the configured aperiodic MUSIM gap collides with the measurement gap associated with the target frequency layer, where MUSIM gap collision rule in section 9.1.10.x3 is applied, longer cell identification period for the target intra-frequency is expected.

 Mpss/sss\_sync\_with\_gaps : For a UE supporting FR2-1 power class 1 or 5, Mpss/sss\_sync with\_gaps=40. For a UE supporting FR2-1 power class 2, Mpss/sss\_sync with\_gaps =24. For a UE supporting FR2-1 power class 3, Mpss/sss\_sync with\_gaps =24. For a UE supporting FR2-1 power class 4, Mpss/sss\_sync with\_gaps =24. For a UE supporting FR2-2 power class 1, Mpss/sss\_sync with\_gaps = 60. For a UE supporting FR2-2 power class 2, Mpss/sss\_sync with\_gaps = 36. For a UE supporting FR2-2 power class 3, Mpss/sss\_sync with\_gaps = 36.

 Mmeas\_period\_ with\_gaps: For a UE supporting FR2-1 power class 1 or 5, Mmeas\_period\_ with\_gaps =40. For a UE supporting FR2-1 power class 2, Mmeas\_period\_ with\_gaps =24. For a UE supporting FR2-1 power class 3, Mmeas\_period\_ with\_gaps =24. For a UE supporting FR2-1 power class 4, Mmeas\_period with\_gaps =24. For a UE supporting FR2-2 power class 1, Mmeas\_period\_ with\_gaps = 60. For a UE supporting FR2-2 power class 2, Mmeas\_period\_ with\_gaps = 36. For a UE supporting FR2-2 power class 3, Mmeas\_period\_ with\_gaps = 36.

- MSSB\_index\_intra: For a UE supporting FR2-2 power class 1, MSSB\_index\_intra = 72. For a UE supporting FR2-2 power class 2, MSSB\_index\_intra = 48. For a UE supporting FR2 power class 3, MSSB\_index\_intra = 48.

If the higher layer signaling in TS 38.331 [2] of *smtc2* is present and smtc1 is fully overlapping with measurement gaps and smtc2 is partially overlapping with measurement gaps, requirements are not specified for Tidentify\_intra\_without\_index or Tidentify\_intra\_with\_index.

If MCG DRX is in use, cell identification requirements for intra-frequency measurement in MCG specified in Table 9.2.6.2-1, Table 9.2.6.2-2, and Table 9.2.6.2-3 shall depend on the MCG DRX cycle. If SCG DRX is in use, cell identification requirements for intra-frequency measurement in SCG specified in Table 9.2.6.2-1, Table 9.2.6.2-2, and Table 9.2.6.2-3 shall depend on the SCG DRX cycle. Otherwise, the requirements for when DRX is not in use shall apply.

Table 9.2.6.2-1: Time period for PSS/SSS detection (FR1)

|  |  |
| --- | --- |
| DRX cycle | TPSS/SSS\_sync\_intra |
| No DRX | max(600ms, 5 x Kgap x max(MGRP, SMTC period)) x CSSFintra |
| DRX cycle≤ 320ms | max(600ms, ceil(M2Note 1x 5 x Kgap) x max(MGRP, SMTC period,DRX cycle)) x CSSFintra |
| DRX cycle>320ms | Ceil( 5 x Kgap ) x max(MGRP, DRX cycle) x CSSFintra |
| NOTE 1: When *highSpeedMeasFlag-r16* is not configured, M2 = 1.5; When *highSpeedMeasFlag-r16* is configured, M2 = 1.5 if SMTC periodicity > 40 ms, otherwise M2=1.NOTE 2: When *highSpeedMeasFlag-r16* is configured, the requirements apply only to UE supporting either *measurementEnhancement-r16* or *intraNR-MeasurementEnhancement-r16* on measurements of the primary component carrier and do not apply to measurements of a secondary component carrier with active SCell.NOTE 3: For a UE supporting concurrent measurement gaps, if multiple concurrent gaps are configured, the MGRP is the periodicity of the MG pattern associated to the intra-frequency layer.NOTE 4: When highSpeedMeasCA-Scell-r17 is configured, the requirements apply to UE on measurements of secondary component carrier with active SCell. |

**Table 9.2.6.2-2: Time period for PSS/SSS detection (FR2)**

|  |  |
| --- | --- |
| DRX cycle | TPSS/SSS\_sync\_intra |
| No DRX | max(600ms, Mpss/sss\_sync\_with\_gaps x KFR x Kgap x max(MGRP, SMTC period)) x CSSFintra |
| DRX cycle≤ 320ms | max(600ms, ceil(1.5x Mpss/sss\_sync\_with\_gaps x KFR x Kgap) x max(MGRP, SMTC period, DRX cycle))x CSSFintra |
| DRX cycle>320ms | Ceil( Mpss/sss\_sync\_with\_gaps x KFR x Kgap ) x max(MGRP, DRX cycle) x CSSFintra |
| NOTE 1: For a UE supporting concurrent gaps, if multiple concurrent gaps are configured, the MGRP is the periodicity of the MG pattern associated to the intra-frequency layer.NOTE 2: KFR is a scaling factor depending on the frequency range and the SSB SCS. For FR2-1, KFR = 1. For FR2-2: KFR = 1 if the SCS of the SSB of the cell being detected is 120 kHz, KFR = 2 if the SCS of the SSB of the cell being detected is 480 kHz, and KFR = 3 if the SCS of the SSB of the cell being detected is 960 kHz. |

Table 9.2.6.2-3: Time period for time index detection (Frequency range FR1)

|  |  |
| --- | --- |
| DRX cycle | TSSB\_time\_index\_intra |
| No DRX | max(120ms, ceil(3 x Kgap ) x max(MGRP, SMTC period)) x CSSFintra |
| DRX cycle≤ 320ms | max(120ms, ceil(M2Note 1x 3 x Kgap) x max(MGRP, SMTC period,DRX cycle) x CSSFintra) |
| DRX cycle>320ms | Ceil(3 x Kgap )x max(MGRP, DRX cycle) x CSSFintra |
| NOTE 1: When *highSpeedMeasFlag-r16* is not configured, M2 = 1.5; When *highSpeedMeasFlag-r16* is configured, M2 = 1.5 if SMTC periodicity > 40 ms, otherwise M2=1.NOTE 2: When *highSpeedMeasFlag-r16* is configured, the requirements apply only to UE supporting either *measurementEnhancement-r16* or *intraNR-MeasurementEnhancement-r16* on measurements of the primary component carrier and do not apply to measurements of a secondary component carrier with active SCell.NOTE 3: For a UE supporting concurrent gaps, if multiple concurrent gaps are configured, the MGRP is the periodicity of the MG pattern associated to the intra-frequency layer.NOTE 4: When highSpeedMeasCA-Scell-r17 is configured, the requirements apply to UE on measurements of secondary component carrier with active SCell. |

Table 9.2.6.2-7: Void

Table 9.2.6.2-8: Void

Table 9.2.6.2-8: Void

Table 9.2.6.2-9: Time period for PSS/SSS detection when *highSpeedMeasFlagFR2-r17* is configured, (FR2) when SMTC period <=40ms

|  |  |
| --- | --- |
| DRX cycle | TPSS/SSS\_sync\_intra |
| No DRX | max(600ms, M1Note 2 x Kgap x max(MGRP, SMTC period)) x CSSFintra |
| DRX cycle≤ 80ms | max(600ms, ceil(M1Note2 x Kgap) x max(MGRP, SMTC period, DRX cycle))x CSSFintra |
| 80ms< DRX cycle≤ 320ms | max(600ms, ceil(Mpss/sss\_sync\_with\_gaps x Kgap) x max(MGRP, SMTC period, DRX cycle))x CSSFintra |
| DRX cycle>320ms | Ceil( Mpss/sss\_sync\_with\_gaps x Kgap ) x max(MGRP, DRX cycle) x CSSFintra |
| NOTE 1: For a UE supporting concurrent gaps, if multiple concurrent gaps are configured, the MGRP is the periodicity of the MG pattern associated to the intra-frequency layer.NOTE 2: For UE supporting power class 6, M1= 6 if *highSpeedMeasFlagFR2-r17* = set1 or M1= 18 if *highSpeedMeasFlagFR2-r17* = set2NOTE 3: Void |

Table 9.2.6.2-10: Time period for time index detection (Frequency range FR2-2)

|  |  |
| --- | --- |
| DRX cycle | TSSB\_time\_index\_intra |
| No DRX | max(200ms, ceil(MSSB\_index\_intra x Kgap x max(MGRP, SMTC period)) x CSSFintra |
| DRX cycle≤ 320ms | max(200ms, ceil(1.5 x MSSB\_index\_intra x Kgap) x max(MGRP, SMTC period, DRX cycle) x CSSFintra) |
| DRX cycle>320ms | Ceil(MSSB\_index\_intra x Kgap)x DRX cycle x CSSFintra |

#### 9.2.6.3 Intrafrequency Measurement Period

The requirements in this clause apply when a measurement gap is provided or when an activated Pre-MG is provided without any pre-MG status changed during the measurement period.

The measurement period for FR1 intrafrequency measurements with gaps is as shown in table 9.2.6.3-1.

The measurement period for FR2 intrafrequency measurements with gaps is as shown in table 9.2.6.3-2.

When *highSpeedMeasFlag-r16* is configured, T SSB\_measurement\_period\_intra is specified in Table 9.2.6.3-3.

If MCG DRX is in use, measurement period requirements for intra-frequency measurement in MCG specified in Table 9.2.6.3-1 and Table 9.2.6.3-2, shall depend on the MCG DRX cycle. If SCG DRX is in use, measurement period requirements for intra-frequency measurement in SCG specified in Table 9.2.6.3-1and Table 9.2.6.3-2, shall depend on the SCG DRX cycle. Otherwise, the requirements for when DRX is not in use shall apply.

For either an FR1 or FR2 serving cell, longer measurement period would be expected during the period Tidentify\_CGI when the UE is requested to decode an NR CGI.

Table 9.2.6.3-1: Measurement period for intra-frequency measurements with gaps(FR1)

|  |  |
| --- | --- |
| DRX cycle | T SSB\_measurement\_period\_intra  |
| No DRX | max(200ms, ceil(5 x Kgap )x max(MGRP, SMTC period)) x CSSFintra |
| DRX cycle≤ 320ms | max(200ms, ceil(1.5x 5 x Kgap) x max(MGRP, SMTC period,DRX cycle))x CSSFintra |
| DRX cycle>320ms | Ceil(5 x Kgap ) x max(MGRP, DRX cycle) x CSSFintra |
| NOTE 1: For a UE supporting concurrent gaps, if multiple concurrent gaps are configured, the MGRP is the periodicity of the MG pattern associated to the intra-frequency layer. |

Table 9.2.6.3-2: Measurement period for intra-frequency measurements with gaps(FR2)

|  |  |
| --- | --- |
| DRX cycle | T SSB\_measurement\_period\_intra  |
| No DRX | max(400ms, ceil(Mmeas\_period with\_gaps x Kgap ) x max(MGRP, SMTC period)) x CSSFintra |
| DRX cycle≤ 320ms | max(400ms, ceil(1.5 x Mmeas\_period with\_gaps x Kgap) x max(MGRP, SMTC period, DRX cycle)) Note 1 x CSSFintra |
| DRX cycle>320ms | Ceil( Mmeas\_period with\_gaps x Kgap ) x max(MGRP, DRX cycle) x CSSFintra |
| NOTE 1: For a UE supporting concurrent gaps, if multiple concurrent gaps are configured, the MGRP is the periodicity of the MG pattern associated to the intra-frequency layer. |

Table 9.2.6.3-3: Measurement period When *highSpeedMeasFlag-r16* is configured (Frequency Range FR1)

|  |  |
| --- | --- |
| DRX cycle | T SSB\_measurement\_period\_intra  |
| No DRX | max(200ms, ceil( 5 x Kgap ) x max(MGRP, SMTC period)) Note 1 x CSSFintra |
| DRX cycle≤ 160ms | max(200ms, ceil(M2Note 2 x 5 x Kgap) x max(MGRP, SMTC period,DRX cycle)) x CSSFintra |
| 160ms < DRX cycle≤ 320ms | max(200ms, ceil(M2Note 2 x 4 x Kgap) x max(MGRP, DRX cycle)) x CSSFintra |
| DRX cycle>320ms | Ceil(Y Note 3 x Kgap ) x max(MGRP, DRX cycle) x CSSFintra |
| NOTE 1: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identifiedNOTE 2: M2 = 1.5 if SMTC periodicity > 40 ms, otherwise M2=1NOTE 3: Y=3 when SMTC <= 40ms, Y=5 when SMTC > 40msNOTE 4: When *highSpeedMeasFlag-r16* is configured, the requirements apply only to UE supporting either *measurementEnhancement-r16* or *intraNR-MeasurementEnhancement-r16* on measurements of the primary component carrier and do not apply to measurements of a secondary component carrier with active SCell.NOTE 5: For a UE supporting concurrent gaps, if multiple concurrent gaps are configured, the MGRP is the periodicity of the MG pattern associated to the intra-frequency layer.NOTE 6: When highSpeedMeasCA-Scell-r17 is configured, the requirements also apply to UE on measurements of secondary component carrier with active SCell. |

Table 9.2.6.3-4: Measurement period for intra-frequency measurements with gaps when *highSpeedMeasFlagFR2-r17* is configured (FR2) when SMTC period<=40ms

|  |  |
| --- | --- |
| DRX cycle | T SSB\_measurement\_period\_intra  |
| No DRX | max(400ms, ceil(M1Note 2 x Kgap ) x max(MGRP, SMTC period)) x CSSFintra |
| DRX cycle≤ 80ms | max(400ms, ceil(M1Note 2 x Kgap) x max(MGRP, SMTC period, DRX cycle)) Note 1 x CSSFintra |
| 80ms< DRX cycle≤ 320ms | max(400ms, ceil(Mmeas\_period with\_gaps x Kgap) x max(MGRP, SMTC period, DRX cycle)) Note 1 x CSSFintra |
| DRX cycle>320ms | Ceil( Mmeas\_period with\_gaps x Kgap ) x max(MGRP, DRX cycle) x CSSFintra |
| NOTE 1: For a UE supporting concurrent gaps, if multiple concurrent gaps are configured, the MGRP is the periodicity of the MG pattern associated to the intra-frequency layer.NOTE 2: For UE supporting power class 6, M1= 6 if *highSpeedMeasFlagFR2-r17* = set1 or M1= 18 if *highSpeedMeasFlagFR2-r17* = set2NOTE 3: Void |

**----------------------END OF CHANGES 1----------------------------**

**----------------------START OF CHANGE 2----------------------------**

### 9.3.4 Inter-frequency measurement with measurement gaps

When measurement gaps are provided, or the UE supports capability of conducting such measurements without gaps, the UE shall be able to identify a new detectable inter frequency cell within Tidentify\_inter\_without\_index if UE is not indicated to report SSB based RRM measurement result with the associated SSB index (*reportQuantityRsIndexes* or *maxNrofRSIndexesToReport* is not configured) or *deriveSSB-IndexFromCellInter-r17* is configured for the FR1 and FR2-1 target frequency layers and and UE supporting *deriveSSB-IndexFromCellInterNon-NCSG-r17*. Otherwise UE shall be able to identify a new detectable inter frequency cell within Tidentify\_inter\_with\_index. The UE shall be able to identify a new detectable inter frequency SS block of an already detected cell within Tidentify\_inter\_without\_index.

Tidentify\_inter\_without\_index = (TPSS/SSS\_sync\_inter + T SSB\_measurement\_period\_inter) ms

Tidentify\_inter\_with\_index = (TPSS/SSS\_sync\_inter + T SSB\_measurement\_period\_inter + TSSB\_time\_index\_inter) ms

Where:

 TPSS/SSS\_sync\_inter: it is the time period used in PSS/SSS detection given in table 9.3.4-1, table 9.3.4-2, and table 9.3.4-5 when *highSpeedMeasInterFreq-r17* is configured and UE supports measurementEnhancementInterFreq-r17. When the SCG is deactivated, table 9.3.4-7 applies for an inter-frequency carrier configured by SCG and not configured by MCG and table 9.3.4-2 applies for an inter-frequency carrier configured by both SCG and MCG. Regardless of whether the SCG is activated or deactivated, table 9.3.4-2 applies for an inter-frequency carrier configured only by MCG.

 TSSB\_time\_index\_inter: it is the time period used to acquire the index of the SSB being measured given in table 9.3.4-3 and table 9.3.4-6 when *highSpeedMeasInterFreq* is configured and UE supports measurementEnhancementInterFreq-r17. When the SCG is deactivated, table 9.3.4-8 applies for an inter-frequency carrier configured by SCG and not configured by MCG and table 9.3.4-4 applies for an inter-frequency carrier configured by both SCG and MCG. Regardless of whether the SCG is activated or deactivated, table 9.3.4-4 applies for an inter-frequency carrier configured only by MCG.

 TSSB\_measurement\_period\_inter: equal to a measurement period of SSB based measurement given in table 9.3.5-1, table 9.3.5-2 and table 9.3.5-3 when *highSpeedMeasInterFreq* is configured and UE supports measurementEnhancementInterFreq-r17. When the SCG is deactivated, table 9.3.5-4 applies for an inter-frequency carrier configured by SCG and not configured by MCG and table 9.3.5-2 applies for an inter-frequency carrier configured by both SCG and MCG. Regardless of whether the SCG is activated or deactivated, table 9.3.5-2 applies for an inter-frequency carrier configured only by MCG.

 Mpss/sss\_sync\_inter: For a UE supporting FR2-1 power class 1 or 5, Mpss/sss\_sync\_inter = 64 samples. For a UE supporting FR2-1 power class 2, Mpss/sss\_sync\_inter = 40 samples. For a UE supporting FR2-1 power class 3, Mpss/sss\_sync\_inter = 40 samples. For a UE supporting FR2-1 power class 4, Mpss/sss\_sync\_inter = 40 samples. For a UE supporting FR2-2 power class 1, Mpss/sss\_sync\_inter = 96. For a UE supporting FR2-2 power class 2, Mpss/sss\_sync\_inter = 60. For a UE supporting FR2-2 power class 3, Mpss/sss\_sync\_inter = 60.

 MSSB\_index\_inter: For a UE supporting FR2-1 power class 1 or 5, MSSB\_index\_inter = 40 samples. For a UE supporting FR2 power class 2, MSSB\_index\_inter = 24 samples. For a UE supporting FR2-1 power class 3, MSSB\_index\_inter = 24 samples. For a UE supporting FR2-1 power class 4, MSSB\_index\_inter = 24 samples. For a UE supporting FR2-2 power class 2 or 3, MSSB\_index\_inter = 48 samples. For a UE supporting FR2 power class 1, MSSB\_index\_inter = 72 samples.

 Mmeas\_period\_inter: For a UE supporting FR2-1 power class 1 or 5, Mmeas\_period\_inter =64. For a UE supporting FR2-1 power class 2, Mmeas\_period\_inter=40. For a UE supporting FR2-1 power class 3, Mmeas\_period\_inter =40. For a UE supporting FR2-1 power class 4, Mmeas\_period\_inter = 40. For a UE supporting FR2-2 power class 1, Mmeas\_period\_inter = 96. For a UE supporting FR2-2 power class 2, Mmeas\_period\_inter = 60. For a UE supporting FR2-2 power class 3, Mmeas\_period\_inter = 60.

 CSSFinter: it is a carrier specific scaling factor and is determined according to CSSFwithin\_gap,i in clause 9.1.5.2 for measurement conducted within measurement gaps.

 Kgap is a scaling factor for a SSB frequency layer to be measured within an associated measurement gap pattern. Kgap = 1 when the UE is not configured with concurrent measurement gaps or MUSIM gaps. Otherwise, Kgap = Ntotal / Navailable, where Navailable and Ntotal are calculated as follows:

- For a window W of duration max(SMTC period, MGRP\_max), where MGRP\_max is the maximum MGRP across all configured per-UE measurement gap(s), periodic MUSIM gaps, and per-FR measurement gap(s) within the same FR, and starting from the beginning of any SMTC occasion:

- Ntotal is the total number of SMTC occasions that are covered by instances of the associated measurement gap within the window W, including those overlapped with other measurement gap and MUSIM gap occasions within the window, and

- Navailable is the number of SMTC occasions that are covered by instances of the non-dropped associated measurement gap within the window W, after accounting for measurement gap and MUSIM gap collisions by applying the collision rules for the measurement gap and MUSIM gap in section 9.1.8.3 and 9.1.10.x3, respectively.

 Requirements in this clause do not apply if Navailable =0.

When UE supports [*musim-GapPreference-r17*] and if the configured aperiodic MUSIM gap collides with the measurement gap associated with the target frequency layer, where MUSIM gap collision rule in section 9.1.10.x3 is applied, longer cell identification period for the target inter-frequency is expected.

Table 9.3.4-1: Time period for PSS/SSS detection (Frequency range FR1)

|  |  |
| --- | --- |
| Condition NOTE1,2 | TPSS/SSS\_sync\_inter |
| No DRX |  Max(600ms, Ceil(8 \* Kgap) × Max(MGRP, SMTC period)) × CSSFinter |
| DRX cycle ≤ 320ms | Max(600ms, Ceil(8\*1.5 \* Kgap) × Max(MGRP, SMTC period, DRX cycle)) × CSSFinter |
| DRX cycle > 320ms | Ceil(8 \* Kgap) × DRX cycle × CSSFinter |
| NOTE 1: DRX or non DRX requirements apply according to the conditions described in clause 3.6.1NOTE 2: In EN-DC operation, the parameters, timers and scheduling requests referred to in clause 3.6.1 are for the secondary cell group. The DRX cycle is the DRX cycle of the secondary cell group.NOTE 3: For a UE supporting concurrent gaps, the MRGP above is the MRGP of the measurement gap associated with the target frequency layer to be measured if concurrent measurement gaps are configured. |

Table 9.3.4-2: Time period for PSS/SSS detection, (Frequency range FR2)

|  |  |
| --- | --- |
| Condition NOTE1,2 | TPSS/SSS\_sync\_inter |
| No DRX | Max(600ms, Ceil(Kgap × Mpss/sss\_sync\_inter x KFR) × Max(MGRP, SMTC period)) × CSSFinter |
| DRX cycle ≤ 320ms | Max(600ms, Ceil(1.5 \* Kgap × Mpss/sss\_sync\_inter x KFR) × Max(MGRP, SMTC period, DRX cycle)) × CSSFinter |
| DRX cycle > 320ms | Ceil(Kgap × Mpss/sss\_sync\_inter x KFR) × DRX cycle × CSSFinter |
| NOTE 1: DRX or non DRX requirements apply according to the conditions described in clause 3.6.1NOTE 2: In EN-DC operation, the parameters, timers and scheduling requests referred to in clause 3.6.1 are for the secondary cell group. The DRX cycle is the DRX cycle of the secondary cell group.NOTE 3: For a UE supporting concurrent gaps, the MRGP above is the MRGP of the measurement gap associated with the target frequency layer to be measured if concurrent measurement gaps are configured.NOTE 4: KFR is a scaling factor depending on the frequency range and the SSB SCS. For FR2-1, KFR = 1. For FR2-2: KFR = 1 if the SCS of the SSB of the cell being detected is 120 kHz, KFR = 2 if the SCS of the SSB of the cell being detected is 480 kHz, and KFR = 3 if the SCS of the SSB of the cell being detected is 960 kHz. |

Table 9.3.4-3: Time period for time index detection (Frequency range FR1)

|  |  |
| --- | --- |
| **Condition NOTE1,2** | **TSSB\_time\_index\_inter** |
| No DRX | Max(120ms, Ceil(3 \* Kgap)× Max(MGRP, SMTC period)) × CSSFinter |
| DRX cycle ≤ 320ms | Max(120ms, Ceil(3 × 1.5 \* Kgap) × Max(MGRP, SMTC period, DRX cycle)) × CSSFinter |
| DRX cycle > 320ms | Ceil(3 \* Kgap)× DRX cycle × CSSFinter |
| NOTE 1: DRX or non DRX requirements apply according to the conditions described in clause 3.6.1NOTE 2: In EN-DC operation, the parameters, timers and scheduling requests referred to in clause 3.6.1 are for the secondary cell group. The DRX cycle is the DRX cycle of the secondary cell group.NOTE 3: For a UE supporting concurrent gaps, the MRGP above is the MRGP of the measurement gap associated with the target frequency layer to be measured if concurrent measurement gaps are configured. |

Table 9.3.4-4: Time period for time index detection (Frequency range FR2)

|  |  |
| --- | --- |
| **Condition NOTE1,2** | **TSSB\_time\_index\_inter** |
| No DRX | Max(200ms, Ceil(Kgap × MSSB\_index\_inter)× Max(MGRP, SMTC period)) × CSSFinter |
| DRX cycle ≤ 320ms | Max(200ms, Ceil(1.5 \* Kgap × MSSB\_index\_inter) × Max(MGRP, SMTC period, DRX cycle)) × CSSFinter |
| DRX cycle > 320ms | Ceil(Kgap ×MSSB\_index\_inter) × DRX cycle × CSSFinter |
| NOTE 1: DRX or non DRX requirements apply according to the conditions described in clause 3.6.1NOTE 2: In EN-DC operation, the parameters, timers and scheduling requests referred to in clause 3.6.1 are for the secondary cell group. The DRX cycle is the DRX cycle of the secondary cell group.NOTE 3: For a UE supporting concurrent gaps, the MRGP above is the MRGP of the measurement gap associated with the target frequency layer to be measured if concurrent measurement gaps are configured. |

Table 9.3.4-5: Time period for PSS/SSS detection when highSpeedMeasInterFreq-r17 is configured (Frequency range FR1)

|  |  |
| --- | --- |
| Condition NOTE1,2 | TPSS/SSS\_sync\_inter |
| No DRX | max(600ms, N1 × Max(MGRP, SMTC period)) × CSSFinterN1 = 7 |
| DRX cycle ≤ 160ms | max(600ms, ceil(N2) x max(MGRP, SMTC period, DRX cycle)) x CSSFinterN2 = 7 x M2 |
| 160ms < DRX cycle ≤ 320ms | ceil(N3) x DRX cycle x CSSFinterN3 = 7 x M2 |
| DRX cycle>320ms | N4 x DRX cycle x CSSFinter |
| NOTE 1: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identifiedNOTE 2: M2 = 1.5 if SMTC periodicity > 40 ms, otherwise M2=1NOTE 3: N4=6 if SMTC periodicity > 40 ms, otherwise N4=5 |

Table 9.3.4-6: Time period for time index detection when highSpeedMeasInterFreq-r17 is configured (Frequency range FR1)

|  |  |
| --- | --- |
| Condition NOTE1,2 | TSSB\_time\_index\_inter |
| No DRX | Max(120ms, 3 × Max(MGRP, SMTC period)) × CSSFinter |
| DRX cycle ≤ 320ms | Max(120ms, Ceil(3 × M2 NOTE3) × Max(MGRP, SMTC period, DRX cycle)) × CSSFinter |
| DRX cycle > 320ms | 3 × DRX cycle × CSSFinter |
| NOTE 1: DRX or non DRX requirements apply according to the conditions described in clause 3.6.1NOTE 2: In EN-DC operation, the parameters, timers and scheduling requests referred to in clause 3.6.1 are for the secondary cell group. The DRX cycle is the DRX cycle of the secondary cell group.NOTE 3: M2 = 1.5 if SMTC periodicity > 40 ms, otherwise M2=1. |

Table 9.3.4-7: Time period for PSS/SSS detection when the inter-frequency carrier is configured only by SCG and the SCG is deactivated (FR2)

|  |  |
| --- | --- |
| Condition NOTE1,2 | TPSS/SSS\_sync\_inter |
| No DRX | Max(600ms, Ceil(Kgap × Mpss/sss\_sync\_inter) × Max(MGRP, measCyclePSCell)) × CSSFinter |
| DRX cycle ≤ 320ms | Max(600ms, Ceil(1.5 \* Kgap × Mpss/sss\_sync\_inter) × Max(MGRP, measCyclePSCell, DRX cycle)) × CSSFinter |
| DRX cycle > 320ms | Ceil(Kgap × Mpss/sss\_sync\_inter) × Max(measCyclePSCell, DRX cycle) × CSSFinter |
| NOTE 1: DRX or non DRX requirements apply according to the conditions described in clause 3.6.1. The DRX cycle is the DRX cycle of the secondary cell group.NOTE 2: In EN-DC operation, the parameters, timers and scheduling requests referred to in clause 3.6.1 are for the secondary cell group. NOTE 3: For a UE supporting concurrent gaps, the MRGP above is the MRGP of the measurement gap associated with the target frequency layer to be measured if concurrent measurement gaps are configured. |

Table 9.3.4-8: Time period for time index detection when inter-frequency carrier is configured only by SCG and the SCG is deactivated (FR2)

|  |  |
| --- | --- |
| Condition NOTE1,2 | TSSB\_time\_index\_inter |
| No DRX | Max(200ms, Ceil(Kgap × MSSB\_index\_inter)× Max(MGRP, measCyclePSCell)) × CSSFinter |
| DRX cycle ≤ 320ms | Max(200ms, Ceil(1.5 \* Kgap × MSSB\_index\_inter) × Max(MGRP, measCyclePSCell, DRX cycle)) × CSSFinter |
| DRX cycle > 320ms | Ceil(Kgap ×MSSB\_index\_inter) × Max(measCyclePSCell, DRX cycle) × CSSFinter |
| NOTE 1: DRX or non DRX requirements apply according to the conditions described in clause 3.6.1. NOTE 2: In EN-DC operation, the parameters, timers and scheduling requests referred to in clause 3.6.1 are for the secondary cell group. The DRX cycle is the DRX cycle of the secondary cell group.NOTE 3: For a UE supporting concurrent gaps, the MRGP above is the MRGP of the measurement gap associated with the target frequency layer to be measured if concurrent measurement gaps are configured. |

#### 9.3.4.1 Void

#### 9.3.4.2 Void

### 9.3.5 Inter-frequency measurements

When measurement gaps are provided for inter frequency measurements, or the UE supports capability of conducting such measurements without gaps, the UE physical layer shall be capable of reporting SS-RSRP, SS-RSRQ and SS-SINR measurements to higher layers with measurement accuracy as specified in clauses 10.1.4, 10.1.5, 10.1.9, 10.1.10, 10.1.14 and 10.1.15, respectively, as shown in table 9.3.5-1 and 9.3.5-2. When *highSpeedMeasInterFreq-r17* is configured, and UE supports *measurementEnhancementInterFreq-r17*, T SSB\_measurement\_period\_inter is specified in Table 9.3.5-3. When SCG is deactivated, T SSB\_measurement\_period\_inter is specified in Table 9.3.5-4 applies for inter-frequency carrier configured by SCG and not configured by MCG and table 9.3.5-2 applies for inter-frequency carrier configured by both SCG and MCG. Regardless of whether the SCG is activated or deactivated, table 9.3.5-2 applies for an inter-frequency carrier configured only by MCG.

Table 9.3.5-1: Measurement period for inter-frequency measurements with gaps (Frequency FR1)

|  |  |
| --- | --- |
| **Condition NOTE1,2** | **T SSB\_measurement\_period\_inter** |
| No DRX | Max(200ms, Ceil(8 \* Kgap) × Max(MGRP, SMTC period)) × CSSFinter |
| DRX cycle ≤ 320ms | Max(200ms, Ceil(8 × 1.5 \* Kgap) × Max(MGRP, SMTC period, DRX cycle)) × CSSFinter |
| DRX cycle > 320ms | Ceil(8 \* Kgap) × DRX cycle × CSSFinter |
| NOTE 1: DRX or non DRX requirements apply according to the conditions described in clause 3.6.1NOTE 2: In EN-DC operation, the parameters, timers and scheduling requests referred to in clause 3.6.1 are for the secondary cell group. The DRX cycle is the DRX cycle of the secondary cell group.NOTE 3: For a UE supporting concurrent gaps, the MRGP above is the MRGP of the measurement gap associated with the target frequency layer to be measured if concurrent measurement gaps are configured. |

Table 9.3.5-2: Measurement period for inter-frequency measurements with gaps (Frequency FR2)

|  |  |
| --- | --- |
| **Condition NOTE1,2** | **T SSB\_measurement\_period\_inter** |
| No DRX | Max(400ms, Ceil(Kgap × Mmeas\_period\_inter)× Max(MGRP, SMTC period)) × CSSFinter |
| DRX cycle ≤ 320ms | Max(400ms, Ceil(1.5 \* Kgap × Mmeas\_period\_inter) × Max(MGRP, SMTC period, DRX cycle)) × CSSFinter |
| DRX cycle > 320ms | Ceil(Kgap × Mmeas\_period\_inter) × DRX cycle × CSSFinter |
| NOTE 1: DRX or non DRX requirements apply according to the conditions described in clause 3.6.1NOTE 2: In EN-DC operation, the parameters, timers and scheduling requests referred to in clause 3.6.1 are for the secondary cell group. The DRX cycle is the DRX cycle of the secondary cell group.NOTE 3: For a UE supporting concurrent gaps, the MRGP above is the MRGP of the measurement gap associated with the target frequency layer to be measured if concurrent measurement gaps are configured. |

Table 9.3.5-3: Measurement period for inter-frequency measurements with gaps when highSpeedMeasInterFreq-r17 is configured (Frequency range FR1)

|  |  |
| --- | --- |
| Condition NOTE1,2 | T SSB\_measurement\_period\_inter |
| No DRX | max(200ms, 7 × Max(MGRP, SMTC period)) × CSSFinter |
| DRX cycle ≤ 160ms | max(200ms, ceil(7 x M2 NOTE3) x max(MGRP, SMTC period, DRX cycle)) x CSSFinter |
| 160ms < DRX cycle ≤ 320ms | ceil(7 x M2 NOTE3) x DRX cycle x CSSFinter |
| DRX cycle>320ms | 4 x M2 NOTE3 x DRX cycle x CSSFinter |
| NOTE 1: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identifiedNOTE 2: In EN-DC operation, the parameters, timers and scheduling requests referred to in clause 3.6.1 are for the secondary cell group. The DRX cycle is the DRX cycle of the secondary cell group.NOTE 3: M2 = 1.5 if SMTC periodicity > 40 ms, otherwise M2=1 |

Table 9.3.5-4: Measurement period for inter-frequency measurements with gaps when the inter-frequency carrier is configured only by SCG and the SCG is deactivated (FR2)

|  |  |
| --- | --- |
| Condition NOTE1,2 | T SSB\_measurement\_period\_inter |
| No DRX | Max(400ms, Ceil(Kgap × Mmeas\_period\_inter)× Max(MGRP, measCyclePSCell)) × CSSFinter |
| DRX cycle ≤ 320ms | Max(400ms, Ceil(1.5 \* Kgap × Mmeas\_period\_inter) × Max(MGRP, measCyclePSCell, DRX cycle)) × CSSFinter |
| DRX cycle > 320ms | Ceil(Kgap × Mmeas\_period\_inter) × Max(measCyclePSCell, DRX cycle) × CSSFinter |
| NOTE 1: DRX or non DRX requirements apply according to the conditions described in clause 3.6.1.NOTE 2: In EN-DC operation, the parameters, timers and scheduling requests referred to in clause 3.6.1 are for the secondary cell group. The DRX cycle is the DRX cycle of the secondary cell group.NOTE 3: For a UE supporting concurrent gaps, the MRGP above is the MRGP of the measurement gap associated with the target frequency layer to be measured if concurrent measurement gaps are configured. |

#### 9.3.5.1 Void

#### 9.3.5.2 Void

#### 9.3.5.3 Void

**----------------------END OF CHANGES 2----------------------------**

**----------------------START OF CHANGE 3----------------------------**

### 9.3.9 Inter frequency measurements without measurement gaps

#### 9.3.9.1 Inter frequency Cell identification

UE satisfying the applicability conditions specified in 9.3.1 on the requirement in this clause shall be able to identify a new detectable inter frequency cell within Tidentify\_inter\_without\_index if UE is not indicated to report SSB based RRM measurement result with the associated SSB index (*reportQuantityRsIndexes* or *maxNrofRSIndexesToReport* is not configured) or *deriveSSB-IndexFromCellInter-r17* is configured for the FR1 and FR2-1 target frequency layers and and UE supporting *deriveSSB-IndexFromCellInterNon-NCSG-r17*. Otherwise UE shall be able to identify a new detectable inter frequency cell within Tidentify\_inter\_with\_index. The UE shall be able to identify a new detectable inter frequency SS block of an already detected cell within Tidentify\_inter\_without\_index.

- For inter-frequency SSB based measurements without measurement gaps in active BWP, it is assumed that when UE performs inter-frequency measurements without measurement gaps in a TDD bands on FR1 and FR2, SFN and frame boundary across serving cell and inter-frequency neighbor cells is aligned

 Tidentify\_inter\_without\_index = (TPSS/SSS\_sync\_inter + T SSB\_measurement\_period\_inter) ms

 Tidentify\_inter\_with\_index = (TPSS/SSS\_sync\_inter + T SSB\_measurement\_period\_inter + TSSB\_time\_index\_inter) ms

Where:

 TPSS/SSS\_sync\_inter: it is the time period used in PSS/SSS detection given in table 9.3.9.1-1 and table 9.3.9.1-2.

 TSSB\_time\_index\_inter: it is the time period used to acquire the index of the SSB being measured given in table 9.3.9.1-3.

 T SSB\_measurement\_period\_inter: equal to a measurement period of SSB based measurement given in table 9.3.9.2-1, table 9.3.9.2-2 and table 9.3.9.2-3 when *highSpeedMeasInterFreq-r17* is configured and UE supports measurementEnhancementInterFreq-r17.

 T SSB\_measurement\_period\_inter: equal to a measurement period of SSB based measurement given in table 9.3.9.2-1, table 9.3.9.2-2, and table 9.3.9.2-3 and table 9.3.9.2-3a when *highSpeedMeasInterFreq-r17* is configured and UE supports measurementEnhancementInterFreq-r17.

 CSSFinter: it is a carrier specific scaling factor and is determined according to CSSFoutside\_gap,i in clause 9.1.5.1 for measurement conducted outside measurement gaps or NCSG, i.e. when interfrequency SMTC is fully non overlapping or partially overlapping with measurement gaps or according to CSSFwithin\_gap,i in clause 9.1.5.2 for measurement conducted within measurement gaps, i.e. when interfrequency SMTC is fully overlapping with measurement gaps, or according to CSSFwithin\_ncsg,i in clause 9.1.5.x for measurement conducted within NCSG, i.e. when inter-frequency SMTC is fully overlapping with NCSG.

For inter-frequency SSB based measurements without measurement gaps in active BWP

 Mpss/sss\_sync\_inter: For a UE supporting FR2-1 power class 1 or 5, Mpss/sss\_sync\_inter = 40. For a UE supporting FR2-1 power class 2, Mpss/sss\_sync\_inter = 24. For a UE supporting FR2-1 power class 3, Mpss/sss\_sync\_inter = 24. For a UE supporting FR2-1 power class 4, Mpss/sss\_sync = 24. For a UE supporting FR2-2 power class 1, Mpss/sss\_sync\_inter = 60. For a UE supporting FR2-2 power class 2, Mpss/sss\_sync\_inter = 36. For a UE supporting FR2-2 power class 3, Mpss/sss\_sync\_inter = 36. For FR1, Mpss/sss\_sync\_inter = 5.

 MSSB\_index\_inter: For a UE supporting FR2-2 power class 1, MSSB\_index\_inter = 72. For a UE supporting FR2-2 power class 2, MSSB\_index\_inter = 48. For a UE supporting FR2-2 power class 3, MSSB\_index\_inter = 48. For FR1, MSSB\_index\_inter = 3.

 Mmeas\_period\_inter: For a UE supporting FR2-1 power class 1 or 5, Mmeas\_period\_inter = 40. For a vehicle mounted UE supporting FR2-1 power class 2, Mpss/sss\_sync\_inter=24. For a UE supporting FR2-1 power class 3, Mmeas\_period\_inter = 24. For a UE supporting FR2-1 power class 4, Mmeas\_period\_inter = 24. For a UE supporting FR2-2 power class 1, Mmeas\_period\_inter = 60. For a UE supporting FR2-2 power class 2, Mpss/sss\_sync\_inter = 36. For a UE supporting FR2-2 power class 3, Mmeas\_period\_inter = 36. For FR1, Mmeas\_period\_inter = 5.

If the UE indicates ‘nogap-noncsg’ via *NeedForGapNCSG-InfoNR* for the inter-frequency measurement,

 Mpss/sss\_sync\_inter: For a UE supporting FR2-1 power class 1 or 5, Mpss/sss\_sync\_inter = 64 samples. For a UE supporting FR2-1 power class 2, Mpss/sss\_sync\_inter = 40 samples. For a UE supporting FR2-1 power class 3, Mpss/sss\_sync\_inter = 40 samples. For a UE supporting FR2-1 power class 4, Mpss/sss\_sync\_inter = 40 samples. For a UE supporting FR2-2 power class 1, Mpss/sss\_sync\_inter = 96. For a UE supporting FR2-2 power class 2, Mpss/sss\_sync\_inter = 60. For a UE supporting FR2-2 power class 3, Mpss/sss\_sync\_inter = 60. For FR1, Mpss/sss\_sync\_inter = 8.

 MSSB\_index\_inter: For a UE supporting FR2-1 power class 1 or 5, MSSB\_index\_inter = 40 samples. For a UE supporting FR2 power class 2, MSSB\_index\_inter = 24 samples. For a UE supporting FR2-1 power class 3, MSSB\_index\_inter = 24 samples. For a UE supporting FR2-1 power class 4, MSSB\_index\_inter = 24 samples. For a UE supporting FR2-2 power class 2 or 3, MSSB\_index\_inter = 48 samples. For a UE supporting FR2 power class 1, MSSB\_index\_inter = 72 samples. For FR1, MSSB\_index\_inter = 3.

 Mmeas\_period\_inter: For a UE supporting FR2-1 power class 1 or 5, Mmeas\_period\_inter =64. For a UE supporting FR2-1 power class 2, Mmeas\_period\_inter=40. For a UE supporting FR2-1 power class 3, Mmeas\_period\_inter =40. For a UE supporting FR2-1 power class 4, Mmeas\_period\_inter = 40. For a UE supporting FR2-2 power class 1, Mmeas\_period\_inter = 96. For a UE supporting FR2-2 power class 2, Mmeas\_period\_inter = 60. For a UE supporting FR2-2 power class 3, Mmeas\_period\_inter = 60. For FR1, Mmeas\_period\_inter = 8. When UE supports *concurrentMeasGap-r17* or *musim-GapPreference-r17* or both concurrent measurement gap and *musim-GapPreference-r17*, and the UE is configured with concurrent measurement gaps or periodic MUSIM gaps or both concurrent gaps and periodic MUSIM gaps.

Kp is a scaling factor for an SSB frequency layer to be measured without measurement gaps. Kp = Ntotal / Navailable, where Navailable and Ntotal are calculated as follows:

 For a window W of duration max(SMTC period, MGRP\_max), where MGRP max is the maximum MGRP across all configured per-UE MG, periodic MUSIM gaps, and per-FR MG within the same FR as the SSB frequency layer, and starting at the beginning of any SMTC occasion:

 Ntotal is the total number of SMTC occasions within the window, including those overlapped with MG and MUSIM gap occasions within the window, and

 Navailable is the number of SMTC occasions that are not overlapped with any non-dropped MG or non-dropped MUSIM gap occasions within the window W, after accounting for MG and MUSIM gap collisions by applying the collision rules for the measurement gap and MUSIM gap in section 9.1.8.3 and 9.1.10.x3, respectively.

 Kp = 1 when Navailable = 0.

 Requirements in this clause do not apply when Navailable = 0 due to fully overlapping between SMTC occasions and MUSIM gap occasions within the window W.

*Editor Note: FSS for the case when Navailable = 0 due to fully overlapping between SMTC occasions and the union of MUSIM gap and measurement gap occasions within the window W.*

When UE supports [*musim-GapPreference-r17]* and the SMTC occasions of the target frequency layer is fully or partially overlapping with the configured aperiodic MUSIM gap, longer cell identification period for the target frequency layer is expected.

Otherwise, when UE is not configured with or UE does not support concurrent measurement gaps and the UE is not configured with MUSIM gaps:

 When interfrequency SMTC is fully non overlapping with measurement gaps or NCSG, or interfrequency SMTC is fully overlapping with MGs or NCSG, Kp =1.

 When interfrequency SMTC is partially overlapping with measurement gaps, Kp = 1/(1- (SMTC period /MGRP)), where SMTC period < MGRP. When inter-frequency SMTC is partially overlapping with NCSG, Kp = 1/(1- (SMTC period /VIRP)), where SMTC period < VIRP.

For FR2,

 Klayer1\_measurement=1,

- if all of the reference signals configured for RLM, BFD, CBD or L1-RSRP for beam reporting on any FR2 serving frequency in the same band outside measurement gap are not fully overlapped by inter-frequency SMTC occasions, or

- if all of the reference signal configured for RLM, BFD, CBD or L1-RSRP for beam reporting on any FR2 serving frequency in the same band outside measurement gap and fully-overlapped by inter-frequency SMTC occasions are not overlapped with any of the SSB symbols and the RSSI symbols, and 1 symbol before each consecutive SSB symbols and the RSSI symbols, and 1 symbol after each consecutive SSB symbols and the RSSI symbols, given that *SSB-ToMeasure* and *SS-RSSI-Measurement* are configured, where SSB symbols are indicated by *SSB-ToMeasure* and RSSI symbols are indicated by *SS-RSSI-Measurement*;

 Klayer1\_measurement=1.5, otherwise.

 If the above-mentioned reference signal configured for L1-RSRP measurement is aperiodic CSI-RS resource, longer cell identification delay would be expected.

For calculation of Kp, if the high layer signalling (TS 38.331 [2]) of *smtc2* is configured, for cells indicated in the *pci-List* parameter in *smtc2*, the SMTC periodicity corresponds to the value of higher layer parameter *smtc2*; for the other cells, the SMTC periodicity corresponds to the value of higher layer parameter *smtc1.*

Table 9.3.9.1-1: Time period for PSS/SSS detection, (FR1)

|  |  |
| --- | --- |
| DRX cycle | TPSS/SSS\_sync\_inter |
| No DRX | max( 600ms, ceil(Mpss/sss\_sync\_inter x Kp) x SMTC period )Note 1 x CSSFinter |
| DRX cycle≤ 320ms | max( 600ms, ceil(M2x Mpss/sss\_sync\_inter x Kp) x max(SMTC period,DRX cycle)) x CSSFinter |
| DRX cycle>320ms | ceil(Mpss/sss\_sync\_inter x Kp) x DRX cycle x CSSFinter |
| NOTE 1: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identifiedNOTE 2: VoidNOTE 3: When *highSpeedMeasInterFreq-r17* is not configured, M2 = 1.5; When *highSpeedMeasInterFreq-r17* is configured, M2 = 1.5 if SMTC periodicity > 40 ms; otherwise M2 = 1 |

Table 9.3.9.1-2: Time period for PSS/SSS detection, (FR2)

|  |  |
| --- | --- |
| DRX cycle | TPSS/SSS\_sync\_inter |
| No DRX | max(600ms, ceil(Mpss/sss\_sync\_inter x Kp x Klayer1\_measurement)x SMTC period)Note 1 x CSSFinter |
| DRX cycle≤ 320ms | max(600ms, ceil(1.5 x Mpss/sss\_sync\_inter x Kp x Klayer1\_measurement)x max(SMTC period,DRX cycle)) x CSSFinter |
| DRX cycle>320ms | ceil(Mpss/sss\_sync\_inter x Kp x Klayer1\_measurement) x DRX cycle x CSSFinter |
| NOTE 1: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identifiedNOTE 2: Void |

Table 9.3.9.1-3: Time period for time index detection (FR1)

|  |  |
| --- | --- |
| DRX cycle | TSSB\_time\_index\_inter |
| No DRX | max(120ms, ceil(MSSB\_index\_inter x Kp )x SMTC period)Note 1 x CSSFinter |
| DRX cycle≤ 320ms | max(120ms, ceil (M2 x MSSB\_index\_inter x Kp) x max(SMTC period,DRX cycle)) x CSSFinter |
| DRX cycle>320ms | Ceil(MSSB\_index\_inter x Kp) x DRX cycle x CSSFinter |
| NOTE 1: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identifiedNOTE 2: VoidNOTE 3: When *highSpeedMeasInterFreq-r17* is not configured, M2 = 1.5; When *highSpeedMeasInterFreq-r17* is configured, M2 = 1.5 if SMTC periodicity > 40 ms; otherwise M2 = 1 |

Table 9.3.9.1-4: Time period for time index detection (FR2-2)

|  |  |
| --- | --- |
| **Condition NOTE1,2** | **TSSB\_time\_index\_inter** |
| No DRX | Max(200ms, Ceil(MSSB\_index\_inter x Kp)× SMTC period) × CSSFinter |
| DRX cycle ≤ 320ms | Max(200ms, Ceil(1.5 × MSSB\_index\_inter x Kp) × Max(SMTC period, DRX cycle)) × CSSFinter |
| DRX cycle > 320ms | Ceil(MSSB\_index\_inter x Kp) × DRX cycle × CSSFinter |
| NOTE 1: DRX or non DRX requirements apply according to the conditions described in clause 3.6.1NOTE 2: Kp is applicable for UE supporting [concurrent gaps] and MUSIM gaps |

#### 9.3.9.2 Measurement period

The UE physical layer shall be capable of reporting SS-RSRP, SS-RSRQ and SS-SINR measurements to higher layers with measurement accuracy as specified in clauses 10.1.4, 10.1.5, 10.1.9, 10.1.10, 10.1.14 and 10.1.15, respectively, as shown in table 9.3.9.2-1 and 9.3.9.2-2, if UE supports inter-frequency measurement without measurement gaps. When highSpeedMeasInterFreq-r17 is configured and UE supports [measurementEnhancementInterFreq-r17], T SSB\_measurement\_period\_inter is specified in table 9.3.9.2-3.

Table 9.3.9.2-1: Measurement period for inter-frequency measurements without gaps ((FR1)

|  |  |
| --- | --- |
| DRX cycle | T SSB\_measurement\_period\_inter  |
| No DRX | max(200ms, ceil(Mmeas\_period\_inter x Kp) x SMTC period)Note 1 x CSSFinter |
| DRX cycle≤ 320ms | max(200ms, ceil(1.5x Mmeas\_period\_inter x Kp) x max(SMTC period,DRX cycle)) x CSSFinter |
| DRX cycle>320ms | ceil( Mmeas\_period\_inter x Kp ) x DRX cycle x CSSFinter |
| NOTE 1: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identified |

Table 9.3.9.2-2: Measurement period for inter-frequency measurements without gaps (FR2)

|  |  |
| --- | --- |
| **DRX cycle** | **T SSB\_measurement\_period\_inter**  |
| No DRX | max(400ms, ceil(Mmeas\_period\_inter x Kp x Klayer1\_measurement) x SMTC period)Note 1 x CSSFinter |
| DRX cycle≤ 320ms | max(400ms, ceil(1.5x Mmeas\_period\_inter x Kp x Klayer1\_measurement) x max(SMTC period,DRX cycle)) x CSSFinter  |
| DRX cycle>320ms | ceil(Mmeas\_period\_inter xKp x Klayer1\_measurement) x DRX cycle x CSSFinter |
| NOTE 1: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identified |

Table 9.3.9.2-3: Measurement period for inter-frequency measurements without gaps in the active BWP when highSpeedMeasInterFreq-r17 is configured (FR1)

|  |  |
| --- | --- |
| **DRX cycle** | **T SSB\_measurement\_period\_inter**  |
| No DRX | max(200ms, ceil( 5 x Kp) x SMTC period)Note 1 x CSSFinter |
| DRX cycle≤ 160ms | max(200ms, ceil(5 x M2 Note 2 x Kp) x max(SMTC period, DRX cycle)) x CSSFinter |
| 160ms < DRX cycle≤ 320ms | ceil(4 x M2 Note 2 x Kp) x max(SMTC period,DRX cycle) x CSSFinter |
| DRX cycle>320ms | ceil( Y Note 3 x Kp ) x DRX cycle x CSSFinter |
| NOTE 1: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identifiedNOTE 2: M2 = 1.5 if SMTC period > 40 ms, otherwise M2 = 1NOTE 3: Y=3 when SMTC period <= 40ms, Y=5 when SMTC period > 40ms |

Table 9.3.9.2-3a: Measurement period for inter-frequency measurements without gaps when highSpeedMeasInterFreq-r17 is configured (FR1), UE supporting ‘nogap-noncsg’

|  |  |
| --- | --- |
| Condition NOTE1,2 | T SSB\_measurement\_period\_inter |
| No DRX | max(200ms, 7 × Max(MGRP, SMTC period)) × CSSFinter |
| DRX cycle ≤ 160ms | max(200ms, ceil(7 x M2 NOTE3) x max(MGRP, SMTC period, DRX cycle)) x CSSFinter |
| 160ms < DRX cycle ≤ 320ms | ceil(7 x M2 NOTE3) x DRX cycle x CSSFinter |
| DRX cycle>320ms | 4 x M2 NOTE3 x DRX cycle x CSSFinter |
| NOTE 1: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identifiedNOTE 2: In EN-DC operation, the parameters, timers and scheduling requests referred to in clause 3.6.1 are for the secondary cell group. The DRX cycle is the DRX cycle of the secondary cell group.NOTE 3: M2 = 1.5 if SMTC periodicity > 40 ms, otherwise M2=1 |

#### 9.3.9.3 Scheduling availability of UE during inter-frequency measurements

If UE supports *interFrequencyMeas-NoGap-r16* and the flag *interFrequencyConfig-NoGap-r16* is configured by the Network, UE is required to be capable of measuring without measurement gaps when the SSB is completely contained in the active bandwidth part of the UE. When any of the conditions in the following clauses is met, there are restrictions on the scheduling availability; otherwise, there is no scheduling restriction. Note that the SSB symbols to be measured in the following clauses are the SSB symbols indicated by SSB-ToMeasure [2], if it is configured; otherwise, all L SSB symbols within the SMTC window duration defined in clause 4.1 of TS 38.213 [3] are included.

The scheduling availability requirements when UE performs inter-frequency measurements without measurement gaps in a TDD bands on FR1 and FR2 in clause 9.3.9.3.1~9.3.9.3.3 are valid under the following conditions:

- SFN and frame boundary across serving cell and inter-frequency neighbor cells is aligned

[For UE supporting MUSIM gaps, when MUSIM gaps are configured, the requirements in 9.3.9.3 are also applied to the slots that are not interrupted according to requirements in clause 9.1.10.x3.y2 and 9.1.10.x3.y3.]

##### 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.

##### 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.

##### 9.3.9.3.3 Scheduling availability of UE performing measurements on FR2

The following scheduling restriction applies due to SS-RSRP or SS-SINR measurement on an FR2 inter-frequency cell

 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.

The following scheduling restriction applies to SS-RSRQ measurement on an FR2 inter-frequency cell

- 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, 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 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.

If 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.

For the SSB and CORESET for RMSI scheduling multiplexing patterns 3, the UE is expected to receive the PDCCH that the UE monitors in the Type0-PDCCH CSS set, and the corresponding PDSCH, on SSB symbols to be measured; and

For the SSB and CORESET for RMSI scheduling multiplexing patterns 2, the UE is expected to receive PDSCH that corresponds to the PDCCH that the UE monitors in the Type0-PDCCH CSS set, on SSB symbols to be measured.

##### 9.3.9.3.4 Scheduling availability of UE performing measurements on FR1 or FR2 in case of FR1-FR2 inter-band CA

There are no scheduling restrictions on FR1 serving cell(s) due to measurements performed on FR2 serving cell frequency layer.

There are no scheduling restrictions on FR2 serving cell(s) due to measurements performed on FR1 serving cell frequency layer.

**----------------------END OF CHANGES 3----------------------------**

**----------------------START OF CHANGE 4----------------------------**

### 9.4.2 NR − E-UTRAN FDD measurements

#### 9.4.2.1 Introduction

The requirements are applicable for NR−E-UTRAN FDD RSRP, RSRQ, and RS-SINR measurements.

In the requirements, an E-UTRAN FDD cell is considered to be detectable when:

- RSRP related conditions in the accuracy requirements in clause 10.2.2 are fulfilled for a corresponding Band, together with the corresponding side conditions in Annex B.2.3 and Annex B.3.3 of TS 36.133 [15],

- RSRQ related conditions in the accuracy requirements in clause 10.2.3 are fulfilled for a corresponding Band, together with the corresponding side conditions in Annex B.2.3 and Annex B.3.3 of TS 36.133 [15],

- RS-SINR related conditions in the accuracy requirements in clause 10.2.5 are fulfilled for a corresponding Band, together with the corresponding side conditions in Annex B.2.3 and Annex B.3.19 of TS 36.133 [15].

#### 9.4.2.2 Requirements when no DRX is used

When the UE requires measurement gaps or NCSG to identify and measure inter-RAT cells and an appropriate measurement gap pattern or NCSG is scheduled, or when the UE is capable of concurrent measurement gap patterns and concurrent measurement gap patterns are scheduled, or an appropriate pre-MG is scheduled and activated, or the UE supports capability of conducting such measurements without gaps, the UE shall be able to identify a new detectable FDD cell within TIdentify, E-UTRAN FDD according to the following expression:

 $T\_{Identify, E-UTRAN FDD}=T\_{BasicIdentify}∙\frac{480}{T\_{Inter1}}∙CSSF\_{interRAT} ms$,

where:

 TBasicIdentify = 480 ms,

 TInter1 is defined in clause 9.4.1,

 CSSFinterRAT = CSSFwithin\_gap,i when measurement gaps are configured, or CSSFwithin\_ncsg,i when NCSGs are configured, is the scaling factor for the measured inter-RAT E-UTRA carrier *i* which is calculated as specified in clause 9.1.5.2.

 For a UE supporting and configured with concurrent measurement gaps or MUSIM gaps or both concurrent measurement gaps and MUSIM gaps, Kgap\_EUTRA: it is the scaling factor for an E-UTRAN frequency layer to be measured within the associated measurement gap pattern. Kgap = 1 when the UE is not configured with concurrent measurement gaps nor MUSIM gaps. Otherwise, Kgap\_EUTRA = Ntotal / Navailable.

 For a window W of duration MGRP\_max, where MGRP\_max is the maximum MGRP across all configured per-UE measurement gap(s), periodic MUSIM gaps, and per-FR measurement gap(s) for FR1, and starting from the beginning of any associated gap occasion:

 Ntotal is the total number of associated gap occasions within the window, including those dropped and non-dropped ocassions within the window, and

 Navailable is the number of non-dropped associated measurement gap occasions after accounting for measurement gap and MUSIM gap collisions by applying the collision rules for the measurement gap and MUSIM gap in section 9.1.8.3 and 9.1.10.x3, respectively.

 Requirements do not apply if Navailable =0

When UE supports [*musim-GapPreference-r17*] and if the configured aperiodic MUSIM gap collides with the measurement gap associated with the target frequency layer, where MUSIM gap collision rule in section 9.1.10.x3 is applied, longer cell identification period for the target inter-RAT carrier is expected.

Identification of a cell shall include detection of the cell and additionally performing a single measurement with measurement period of TMeasure, E-UTRAN FDD defined in Table 9.4.2.2-1.

**Table 9.4.2.2-1:** M**easurement period and measurement bandwidth**

|  |  |  |
| --- | --- | --- |
| **Configuration** | **Physical Layer Measurement period: TMeasure, E-UTRAN FDD [ms]**  | **Measurement bandwidth [RB]** |
| 0 | 480 x [CSSFinterRAT x Ceil(Kgap\_EUTRA)] | 6 |
| 1 (Note 1) | 240 x [CSSFinterRAT x Ceil(Kgap\_EUTRA)] | 50 |
| NOTE 1: This configuration is optional.NOTE 2: Kgap\_EUTRA = 1 for a UE that does not support concurrent measurement gaps nor MUSIM gaps. |

When measurement gaps are scheduled for E-UTRAN FDD inter-RAT measurements, or the UE supports capability of conducting such measurements without gaps, the UE physical layer shall be capable of reporting RSRP, RSRQ, and RS-SINR measurements to higher layers with measurement period TMeasure, E-UTRAN FDDgiven by table 9.4.2.2-1.

If higher layer filtering is used, an additional cell identification delay can be expected.

The NR – E-UTRAN FDD RSRP measurement accuracy for all measured cells shall be as specified in clause 10.2.2. The NR – E-UTRAN FDD RSRQ measurement accuracy for all measured cells shall be as specified in clause 10.2.3. The NR – E-UTRAN FDD RS-SINR measurement accuracy for all measured cells shall be as specified in clause 10.2.5.

#### 9.4.2.3 Requirements when DRX is used

When DRX is in use and an appropriate measurement gap pattern or NCSG is configured, or when the UE is capable of concurrent measurement gap patterns and concurrent measurement gap patterns are configured, or an appropriate pre-MG is scheduled and activated, the UE shall be able to identify a new detectable E-UTRAN FDD cell within TIdentify, E-UTRAN FDD specified in Table 9.4.2.3-1. When *highSpeedMeasFlag-r16* is configured and UE supports the enhanced inter-RAT E-UTRAN measurement requirements, the UE shall be able to identify a new detectable E-UTRAN FDD cell within TIdentify, E-UTRAN FDD specified in Table 9.4.2.3-2.

 For a UE supporting and configured with concurrent measurement gaps or MUSIM gaps or both concurrent measurement gaps and MUSIM gaps, Kgap\_EUTRA: it is the scaling factor for an E-UTRAN frequency layer to be measured within the associated measurement gap pattern. Kgap = 1 when the UE is not configured with concurrent measurement gaps nor MUSIM gaps. Otherwise, Kgap\_EUTRA = Ntotal / Navailable.

 For a window W of duration MGRP\_max, where MGRP\_max is the maximum MGRP across all configured per-UE measurement gap(s), periodic MUSIM gap(s), and per-FR measurement gap(s) for FR1, and starting from the beginning of any associated gap occasion:

 Ntotal is the total number of associated gap occasions within the window, including both dropped and non-dropped occasions within the window, and

 Navailable is the number of non-dropped associated measurement gap occasions after accounting for measurement gap and MUSIM gap collisions by applying the collision rules for the measurement gap and MUSIM gap in section 9.1.8.3 and 9.1.10.x3, respectively.

 Requirements do not apply if Navailable =0

When UE supports [*musim-GapPreference-r17*] and if the configured aperiodic MUSIM gap collides with the measurement gap associated with the target frequency layer, where MUSIM gap collision rule in section 9.1.10.x3 is applied, longer cell identification period for the target inter-RAT carrier is expected.

Table 9.4.2.3-1: Requirement to identify a newly detectable E-UTRAN FDD cell

|  |  |
| --- | --- |
| **DRX cycle length (s)** | **TIdentify, E-UTRAN FDD (s) (DRX cycles)** |
|  | Gap/NCSG period = 40 ms, 20 ms | Gap/NCSG period = 80 ms |
| ≤0.16 | Non-DRX requirements in clause 9.4.2.2 apply | Non-DRX requirements in clause 9.4.2.2 apply |
| 0.256 | 5.12\* CSSFinterRAT x Ceil(Kgap\_EUTRA) (20\*CSSFinterRAT x Ceil(Kgap\_EUTRA)) | 7.68\* CSSFinterRAT x Ceil(Kgap\_EUTRA) (30\*CSSFinterRAT x Ceil(Kgap\_EUTRA)) |
| 0.32 | 6.4\* CSSFinterRAT x Ceil(Kgap\_EUTRA) (20\*CSSFinterRAT x Ceil(Kgap\_EUTRA)) | 7.68\* CSSFinterRAT x Ceil(Kgap\_EUTRA) (24\*CSSFinterRAT x Ceil(Kgap\_EUTRA)) |
| 0.32< DRX-cycle ≤10.24 | Note1 (20\*CSSFinterRAT x Ceil(Kgap\_EUTRA)) | Note1 (20\*CSSFinterRAT x Ceil(Kgap\_EUTRA)) |
| NOTE 1: The time depends on the DRX cycle length.NOTE 2: CSSFinterRAT is as defined in clause 9.4.2.2.NOTE 3: Kgap\_EUTRA = 1 for a UE that does not support concurrent measurement gaps nor MUSIM gaps. NOTE 4: If multiple concurrent gaps are configured, the gap period is the periodicity of the MG pattern associated to the E-UTRA inter-RAT frequency layer. |

Table 9.4.2.3-2: Requirement to identify a newly detectable E-UTRAN FDD cell when *highSpeedMeasFlag-r16* is configured

|  |  |
| --- | --- |
| DRX cycle length (s) | TIdentify, E-UTRAN FDD (s) (DRX cycles) |
|  | Gap/NCSG period = 40 ms, 20 ms | Gap/NCSG period = 80 ms |
| ≤0.16 | Non-DRX requirements in clause 9.4.2.2 apply | Non-DRX requirements in clause 9.4.2.2 apply |
| 0.16<DRx cycle<=0.32 |  Note 1(15\*CSSFinterRAT x Ceil((Kgap\_EUTRA)) |  |
| 0.32<DRx cycle <= 0.64 | Note 1(10\*CSSFinterRAT x Ceil(Kgap\_EUTRA)) |  |
| DRx cycle = 1.024 | Note 1(10\*CSSFinterRAT x Ceil( Kgap\_EUTRA)) | Note 1(10\*CSSFinterRAT x Ceil(Kgap\_EUTRA)) |
| DRx cycle = 1.28 | Note 1(8\*CSSFinterRAT x Ceil( Kgap\_EUTRA)) | Note 1(8\*CSSFinterRAT x Ceil(Kgap\_EUTRA)) |
| 1.28< DRX-cycle ≤10.24 | Note1 (20\*CSSFinterRAT x Ceil( Kgap\_EUTRA)) | Note1 (20\*CSSFinterRAT x Ceil(Kgap\_EUTRA)) |
| NOTE 1: The time depends on the DRX cycle length.NOTE 2: CSSFinterRAT is as defined in clause 9.4.2.2.NOTE 3: When *highSpeedMeasFlag-r16* is configured, the requirements apply only to UE supporting either *measurementEnhancement-r16* or *[interRAT-MeasurementEnhancement-r16].*NOTE 4: Kgap\_EUTRA = 1 for a UE that does not support concurrent measurement gaps nor MUSIM gaps. NOTE 5: If multiple concurrent gaps are configured, the gap period is the periodicity of the MG pattern associated to the E-UTRA inter-RAT frequency layer. |

When DRX is in use, the UE shall be capable of performing NR – E-UTRAN FDD RSRP, RSRQ, and RS-SINR measurements of at least 4 identified E-UTRAN FDD cells per E-UTRA FDD frequency layer during each layer 1 measurement period, for up to 7 E-UTRA FDD carrier frequency layers, and the UE physical layer shall be capable of reporting NR – E-UTRAN FDD RSRP, RSRQ, and RS-SINR measurements to higher layers with the measurement period Tmeasure, E-UTRAN FDD specified in Table 9.4.2.3-2.

**Table 9.4.2.3-2: Requirement to measure E-UTRAN FDD cells**

|  |  |
| --- | --- |
| **DRX cycle length (s)** | **Tmeasure, E-UTRAN FDD (s) (DRX cycles)**  |
| ≤0.08 | Non-DRX requirements in clause 9.4.2.2 apply |
| 0.08< DRX-cycle ≤10.24 | Note1 (5\* CSSFinterRAT x Ceil(Kgap\_EUTRA)) |
| NOTE 1: The time depends on the DRX cycle length.NOTE 2: CSSFinterRAT is as defined in clause 9.4.2.2.NOTE 3: Kgap\_EUTRA = 1 for a UE that does not support concurrent measurement gaps nor MUSIM gaps.  |

If higher layer filtering is used, an additional cell identification delay can be expected.

The NR – E-UTRAN FDD RSRP measurement accuracy for all measured cells shall be as specified in clause 10.2.2. The NR – E-UTRAN FDD RSRQ measurement accuracy for all measured cells shall be as specified in clause 10.2.3. The NR – E-UTRAN FDD RS-SINR measurement accuracy for all measured cells shall be as specified in clause 10.2.5.

#### 9.4.2.4 Measurement reporting requirements

##### 9.4.2.4.1 Periodic Reporting

The reported NR – E-UTRAN FDD RSRP, RSRQ, and RS-SINR measurements contained in periodically triggered measurement reports shall meet the requirements in clauses 10.2.2, 10.2.3, and 10.2.5, respectively.

##### 9.4.2.4.2 Event-Triggered Periodic Reporting

The reported NR – E-UTRAN FDD RSRP, RSRQ, and RS-SINR measurements contained in event-triggered periodic measurement reports shall meet the requirements in clauses 10.2.2, 10.2.3, and 10.2.5, respectively.

The first report in event-triggered periodic measurement reporting shall meet the requirements specified in clause 9.4.2.4.3.

##### 9.4.2.4.3 Event-Triggered Reporting

The reported NR – E-UTRAN FDD RSRP, RSRQ, and RS-SINR measurements contained in event-triggered measurement reports shall meet the requirements in clauses 10.2.2, 10.2.3, and 10.2.5, respectively.

The UE shall not send any event-triggered measurement reports as long as no reporting criteria are fulfilled.

The measurement reporting delay is defined as the time between an event that will trigger a measurement report and the point when the UE starts to transmit the measurement report over the air interface. This requirement assumes that that the measurement report is not delayed by other RRC signalling on the DCCH. This measurement reporting delay excludes a delay uncertainty resulted when inserting the measurement report to the TTI of the uplink DCCH. The delay uncertainty is: 2 x TTIDCCH where TTIDCCH is the duration of subframe or slot or subslot when the measurement report is transmitted on the PUSCH with subframe or slot or subslot duration. This measurement reporting delay excludes a delay which caused by no UL resources for UE to send the measurement report.

The event triggered measurement reporting delay, measured without L3 filtering shall be less than T Identify, E-UTRAN FDD defined in clauses 9.4.2.2 and 9.4.2.3 without DRX and with DRX, respectively.When L3 filtering is used, an additional delay can be expected.

If a cell which has been detectable at least for the time period TIdentify, E-UTRAN FDD becomes undetectable for a period ≤ 5 seconds and then the cell becomes detectable again and triggers an event as per TS 38.331 [2], the event triggered measurement reporting delay shall be less than TMeasure, E-UTRAN FDD provided the timing to that cell has not changed more than ± 50 Ts while measurement gap or NCSG has not been available and the L3 filter has not been used.

### 9.4.3 NR − E-UTRAN TDD measurements

#### 9.4.3.1 Introduction

The requirements are applicable for NR−E-UTRAN TDD RSRP, RSRQ, and RS-SINR measurements.

In the requirements, an E-UTRAN TDD cell is considered to be detectable when:

- RSRP related conditions in the accuracy requirements in clause 10.2.2 are fulfilled for a corresponding Band, together with the corresponding side conditions in Annex B.2.3 and Annex B.3.3 of TS 36.133 [15],

- RSRQ related conditions in the accuracy requirements in clause 10.2.3 are fulfilled for a corresponding Band, together with the corresponding side conditions in Annex B.2.3 and Annex B.3.3 of TS 36.133 [15],

 RS-SINR related conditions in the accuracy requirements in clause 10.2.5 are fulfilled for a corresponding Band, together with the corresponding side conditions in Annex B.2.3 and Annex B.3.19 of TS 36.133 [15].

#### 9.4.3.2 Requirements when no DRX is used

When the UE requires measurement gaps or NCSG to identify and measure inter-RAT cells and an appropriate measurement gap pattern or NCSG is scheduled, or when the UE is capable of concurrent measurement gap patterns and concurrent measurement gap patterns are scheduled, or an appropriate pre-MG is scheduled and activated or the UE supports capability of conducting such measurements without gaps, the UE shall be able to identify a new detectable TDD cell within TIdentify, E-UTRAN TDD according to the following expression:

- When configuration 0 or configuration 1 in Table 9.4.3.2-1 is applied,

 $T\_{Identify, E-UTRAN TDD}=T\_{BasicIdentify}∙\frac{480}{T\_{Inter1}}∙CSSF\_{interRAT} ms$,

- When configuration 2 or configuration 3 in Table 9.4.3.2-1 is applied,

 $T\_{Identify, E-UTRAN TDD}=T\_{BasicIdentify}∙\frac{480}{T\_{Inter1}}∙CSSF\_{interRAT}+240∙CSSF\_{interRAT} ms$,

where:

 TBasicIdentify = 480 ms,

 TInter1 is defined in clause 9.4.1,

 CSSFinterRAT = CSSFwithin\_gap,i when measurement gaps are configured, or CSSFwithin\_ncsg,i when NCSGs are configured, is the scaling factor for the measured inter-RAT E-UTRA carrier *i* which is calculated as specified in clause 9.1.5.2.

For a UE supporting and configured with concurrent measurement gaps or MUSIM gaps or both concurrent measurement gaps and MUSIM gaps, Kgap\_EUTRA: it is the scaling factor for an E-UTRAN frequency layer to be measured within the associated measurement gap pattern. Kgap = 1 when the UE is not configured with concurrent measurement gaps nor MUSIM gaps. Otherwise, Kgap\_EUTRA = Ntotal / Navailable for UE configured with concurrent measurement gaps or MUSIM gaps.

- For a window W of duration MGRP\_max, where MGRP\_max is the maximum MGRP across all configured per-UE measurement gap(s), periodic MUSIM gaps, and per-FR measurement gap(s) for FR1, and starting from the beginning of any associated gap occasion:

- Ntotal is the total number of associated gap occasions within the window, including those overlapped with other measurement gap and MUSIM gap ocassions within the window, and

- Navailable is the number of non-dropped associated measurement gap occasions after accounting for measurement gap and MUSIM gap collisions by applying the collision rules for the measurement gap and MUSIM gap in section 9.1.8.3 and 9.1.10.x3, respectively.

- Requirements do not apply for UE configured with concurrent measurement gaps or MUSIM gaps, if Navailable =0

When UE supports [*musim-GapPreference-r17*] and if the configured aperiodic MUSIM gap collides with the measurement gap associated with the target frequency layer, where MUSIM gap collision rule in section 9.1.10.x3 is applied, longer cell identification period for the target inter-RAT carrier is expected.

Identification of a cell shall include detection of the cell and additionally performing a single measurement with measurement period of TMeasure, E-UTRAN TDD defined in Table 9.4.3.2-1.

Table 9.4.3.2-1: TMeasure, E-UTRAN TDD for different configurations

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Configuration | Measurement bandwidth (RB) | Number of UL/DL sub-frames per half frame (5 ms) | DwPTS | TMeasure, E-UTRAN TDD (ms) |
|  |  | DL | UL | Normal CP | Extended CP |  |
| 0 | 6 | 2 | 2 |  |  | 480 x CSSFinterRAT x Ceil(Kgap\_EUTRA) |
| 1 (Note 1) | 50 | 2 | 2 |  |  | 240 x CSSFinterRAT x Ceil(Kgap\_EUTRA) |
| 2 | 6 | 1 | 3 |  |  | 720 x CSSFinterRAT x Ceil(Kgap\_EUTRA) |
| 3 (Note 1) | 50 | 1 | 3 |  |  | 480 x CSSFinterRAT x Ceil(Kgap\_EUTRA) |
| NOTE 1: This configuration is optional.NOTE 2: VoidNOTE 3: Kgap\_EUTRA is only applicable for a UE supporting concurrent measurement gaps and/or MUSIM gaps. Otherwise Kgap\_EUTRA =1 |

When measurement gaps are scheduled for E-UTRAN TDD inter-RAT measurements, or the UE supports capability of conducting such measurements without gaps, the UE physical layer shall be capable of reporting RSRP, RSRQ, and RS-SINR measurements to higher layers with measurement period Tmeasure, E-UTRAN TDD given by table 9.4.3.2-1.

If higher layer filtering is used, an additional cell identification delay can be expected.

The NR – E-UTRAN TDD RSRP measurement accuracy for all measured cells shall be as specified in clause 10.2.2. The NR – E-UTRAN TDD RSRQ measurement accuracy for all measured cells shall be as specified in clause 10.2.3. The NR – E-UTRAN TDD RS-SINR measurement accuracy for all measured cells shall be as specified in clause 10.2.5.

#### 9.4.3.3 Requirements when DRX is used

When DRX is in use and an appropriate measurement gap pattern or NCSG is configured, or when the UE is capable of concurrent measurement gap patterns and concurrent measurement gap patterns are configured, or an appropriate pre-MG is scheduled and activated, the UE shall be able to identify a new detectable E-UTRAN TDD cell within TIdentify, E-UTRAN TDD specified in Table 9.4.3.3-1. When *highSpeedMeasFlag-r16* is configured and UE supports the enhanced inter-RAT E-UTRAN measurement requirements, the UE shall be able to identify a new detectable E-UTRAN TDD cell within TIdentify, E-UTRAN TDD specified in Table 9.4.3.3-2.

 For a UE supporting and configured with concurrent measurement gaps or MUSIM gaps or both concurrent measurement gaps and MUSIM gaps, Kgap\_EUTRA: it is the scaling factor for an E-UTRAN frequency layer to be measured within the associated measurement gap pattern. Kgap = 1 when the UE is not configured with concurrent measurement gaps nor MUSIM gaps. Otherwise, Kgap\_EUTRA = Ntotal / Navailable for UE configured with concurrent measurement gaps or MUSIM gaps.

 For a window W of duration MGRP\_max, where MGRP\_max is the maximum MGRP across all configured per-UE measurement gap(s), periodic MUSIM gap(s), and per-FR measurement gap(s) for FR1, and starting from the beginning of any associated gap occasion:

 Ntotal is the total number of associated gap occasions within the window, including those overlapped with other measurement gap and MUSIM gap instances within the window, and

 Navailable is the number of non-dropped associated measurement gap occasions after accounting for measurement gap and MUSIM gap collisions by applying the collision rules for the measurement gap and MUSIM gap in section 9.1.8.3 and 9.1.10.x3, respectively.

 Requirements do not apply for UE configured with concurrent measurement gaps or MUSIM gaps, if Navailable =0

When UE supports [*musim-GapPreference-r17*] and if the configured aperiodic MUSIM gap collides with the measurement gap associated with the target frequency layer, where MUSIM gap collision rule in section 9.1.10.x3 is applied, longer cell identification period for the target inter-RAT carrier is expected.

Table 9.4.3.3-1: Requirement to identify a newly detectable E-UTRAN TDD cell

|  |  |
| --- | --- |
| DRX cycle length (s) | TIdentify, E-UTRAN TDD (s) (DRX cycles) |
|  | Gap/NCSG period = 40 ms, 20 ms | Gap/NCSG period = 80 ms |
| ≤0.16 | Non-DRX requirements in clause 9.4.3.2 apply | Non-DRX requirements in clause 9.4.3.2 apply |
| 0.256 | 5.12\* CSSFinterRAT x Ceil(Kgap\_EUTRA) (20\*CSSFinterRAT x Ceil(Kgap\_EUTRA)) | 7.68\* CSSFinterRAT x Ceil(Kgap\_EUTRA) (30\*CSSFinterRAT x Ceil(Kgap\_EUTRA)) |
| 0.32 | 6.4\* CSSFinterRAT x Ceil(Kgap\_EUTRA) (20\*CSSFinterRAT x Ceil(Kgap\_EUTRA)) | 7.68\* CSSFinterRAT x Ceil(Kgap\_EUTRA) (24\*CSSFinterRAT x Ceil(Kgap\_EUTRA)) |
| 0.32< DRX-cycle ≤10.24 | Note1 (20\*CSSFinterRAT x Ceil(Kgap\_EUTRA)) | Note1 (20\*CSSFinterRAT x Ceil(Kgap\_EUTRA)) |
| NOTE 1: The time depends on the DRX cycle length.NOTE 2: CSSFinterRAT is as defined in clause 9.4.3.2.NOTE 3: Kgap\_EUTRA is only applicable for a UE supporting concurrent measurement gaps and/or MUSIM gaps. Otherwise Kgap\_EUTRA =1NOTE 4: If multiple concurrent gaps are configured, the gap period is the periodicity of the MG pattern associated to the E-UTRA inter-RAT frequency layer. |

Table 9.4.3.3-2: Requirement to identify a newly detectable E-UTRAN TDD cell when *highSpeedMeasFlag-r16* is configured

|  |  |
| --- | --- |
| DRX cycle length (s) | TIdentify, E-UTRAN TDD (s) (DRX cycles) |
|  | Gap/NCSG period = 40 ms, 20 ms | Gap/NCSG period = 80 ms |
| ≤0.16 | Non-DRX requirements in clause 9.4.3.2 apply | Non-DRX requirements in clause 9.4.3.2 apply |
| 0.16<DRx cycle<=0.32 |  Note 1(15\*CSSFinterRAT x Ceil(Kgap\_EUTRA)) |  |
| 0.32<DRx cycle <= 0.64 | Note 1(10\*CSSFinterRAT x Ceil(Kgap\_EUTRA)) |  |
| DRx cycle = 1.024 | Note 1(10\*CSSFinterRAT x Ceil(Kgap\_EUTRA)) | Note 1(10\*CSSFinterRAT x Ceil(Kgap\_EUTRA)) |
| DRx cycle = 1.28 | Note 1(8\*CSSFinterRAT x Ceil(Kgap\_EUTRA)) | Note 1(8\*CSSFinterRAT x Ceil(Kgap\_EUTRA)) |
| 1.28< DRX-cycle ≤10.24 | Note1 (20\*CSSFinterRAT x Ceil(Kgap\_EUTRA)) | Note1 (20\*CSSFinterRAT x Ceil(Kgap\_EUTRA)) |
| NOTE 1: The time depends on the DRX cycle length.NOTE 2: CSSFinterRAT is as defined in clause 9.4.3.2.NOTE 3: When *highSpeedMeasFlag-r16* is configured, the requirements apply only to UE supporting either *measurementEnhancement-r16* or *[interRAT-MeasurementEnhancement-r16].*NOTE 4: Kgap\_EUTRA is only applicable for a UE supporting concurrent measurement gaps and/or MUSIM gaps. Otherwise Kgap\_EUTRA =1NOTE 5: If multiple concurrent gaps are configured, the gap period is the periodicity of the MG pattern associated to the E-UTRA inter-RAT frequency layer. |

When DRX is in use, the UE shall be capable of performing NR – E-UTRAN TDD RSRP, RSRQ, and RS-SINR measurements of at least 4 identified E-UTRAN TDD cells per E-UTRA TDD frequency layer during each layer 1 measurement period, for up to 7 E-UTRA TDD carrier frequency layers, and the UE physical layer shall be capable of reporting NR – E-UTRAN TDD RSRP, RSRQ, and RS-SINR measurements to higher layers with the measurement period Tmeasure, E-UTRAN TDD specified in Table 9.4.3.3-3.

Table 9.4.3.3-3: Requirement to measure E-UTRAN TDD cells

|  |  |
| --- | --- |
| DRX cycle length (s) | Tmeasure, E-UTRAN TDD (s) (DRX cycles) |
| ≤0.08 | Non-DRX Requirements in clause 9.4.3.2 apply |
| 0.128 | For configuration 2 Note3, non-DRX requirements in clause 9.4.3.2 apply,Otherwise: Note1 (5\*CSSFinterRAT x Ceil(Kgap\_EUTRA)) |
| 0.128<DRX-cycle≤10.24 | Note1 (5\*CSSFinterRAT x Ceil(Kgap\_EUTRA)) |
| NOTE 1: The time depends on the DRX cycle length.NOTE 2: CSSFinterRAT is as defined in clause 9.4.3.2.NOTE 3: See Table 9.4.3.2-1.NOTE 4: Kgap\_EUTRA is only applicable for a UE supporting concurrent measurement gaps and/or MUSIM gaps. Otherwise Kgap\_EUTRA =1 |

If higher layer filtering is used, an additional cell identification delay can be expected.

The NR – E-UTRAN TDD RSRP measurement accuracy for all measured cells shall be as specified in clause 10.2.2. The NR – E-UTRAN TDD RSRQ measurement accuracy for all measured cells shall be as specified in clause 10.2.3. The NR – E-UTRAN TDD RS-SINR measurement accuracy for all measured cells shall be as specified in clause 10.2.5.

#### 9.4.3.4 Measurement reporting requirements

##### 9.4.3.4.1 Periodic Reporting

The reported NR – E-UTRAN TDD RSRP, RSRQ, and RS-SINR measurements contained in periodically triggered measurement reports shall meet the requirements in clauses 10.2.2, 10.2.3, and 10.2.5, respectively.

##### 9.4.3.4.2 Event-Triggered Periodic Reporting

The reported NR – E-UTRAN TDD RSRP, RSRQ, and RS-SINR measurements contained in event-triggered periodic measurement reports shall meet the requirements in clauses 10.2.2, 10.2.3, and 10.2.5, respectively.

The first report in event-triggered periodic measurement reporting shall meet the requirements specified in clause 9.4.3.4.3.

##### 9.4.3.4.3 Event-Triggered Reporting

The reported NR – E-UTRAN TDD RSRP, RSRQ, and RS-SINR measurements contained in event-triggered measurement reports shall meet the requirements in clauses 10.2.2, 10.2.3, and 10.2.5, respectively.

The UE shall not send any event-triggered measurement reports as long as no reporting criteria are fulfilled.

The measurement reporting delay is defined as the time between an event that will trigger a measurement report and the point when the UE starts to transmit the measurement report over the air interface. This requirement assumes that that the measurement report is not delayed by other RRC signalling on the DCCH. This measurement reporting delay excludes a delay uncertainty resulted when inserting the measurement report to the TTI of the uplink DCCH. The delay uncertainty is: 2 x TTIDCCH where TTIDCCH is the duration of subframe or slot or subslot when the measurement report is transmitted on the PUSCH with subframe or slot or subslot duration. This measurement reporting delay excludes a delay which caused by no UL resources for UE to send the measurement report.

The event triggered measurement reporting delay, measured without L3 filtering shall be less than T Identify, E-UTRAN TDD defined in clauses 9.4.3.2 and 9.4.3.3 without DRX and with DRX, respectively.When L3 filtering is used, an additional delay can be expected.

If a cell which has been detectable at least for the time period TIdentify, E-UTRAN TDD becomes undetectable for a period ≤ 5 seconds and then the cell becomes detectable again and triggers an event as per TS 38.331 [2], the event triggered measurement reporting delay shall be less than TMeasure, E-UTRAN TDD provided the timing to that cell has not changed more than ± 50 Ts while measurement gap or NCSG has not been available and the L3 filter has not been used.

#### 9.4.3.5 Scheduling Availability During NR − E-UTRAN TDD measurements with NCSG

When UE supports *simultaneousRxTxInterBandENDC* for a band combination, no scheduling restriction is applicable to NR − E-UTRAN TDD measurements with NCSG in this band combination; otherwise UE is not expected to transmit PUCCH/PUSCH/SRS on all symbols within NCSG ML.

**----------------------END OF CHANGES 4----------------------------**

**----------------------START OF CHANGE 5 ----------------------------**

#### 9.5.4.1 SSB based L1-RSRP Reporting

The UE shall be capable of performing L1-RSRP measurements based on the configured SSB resource for L1-RSRP computation, and the UE physical layer shall be capable of reporting L1-RSRP measured over the measurement period of TL1-RSRP\_Measurement\_Period\_SSB.

The value of TL1-RSRP\_Measurement\_Period\_SSB is defined in Table 9.5.4.1-1 for FR1. The value of TL1-RSRP\_Measurement\_Period\_SSB is defined in Table 9.5.4.1-2 for FR2 when *highSpeedMeasFlagFR2-r17* is not configured, and defined in Table 9.5.4.1-3 for FR2 power class 6 UE when *highSpeedMeasFlagFR2-r17* is configured, where

- M=1 if higher layer parameter *timeRestrictionForChannelMeasurement* is configured, and M=3 otherwise

- N= 8 in Table 9.5.4.1-2.

When UE supports concurrent measurement gap or *musim-GapPreference-r17* or both concurrent measurement gap and *musim-GapPreference-r17*, and concurrent gaps or periodic MUSIM gaps or both concurrent gaps and periodic MUSIM gaps are configured,

- P value for SSB resource to be measured is defined as

- Ntotal / Noutside\_MG in FR1

- Psharing factor \* Ntotal / Noutside\_MG in FR2 with Navailable = 0

- Ntotal / Navailable in FR2 with Navailable > 0

- For a window W of duration max(TL1, MGRP\_max), where MGRP max is the maximum MGRP across all configured per-UE measurement gaps, MUSIM gap(s) and per-FR measurement gaps within the same FR as serving cell, and starting at the beginning of any SSB resource occasion:

- Ntotal is the total number of SSB resource occasions within the window, including those overlapped with measurement gap occasions, MUSIM gap occasions or SMTC occasions within the window, and

- Noutside\_MG is the number of SSB resource occasions that are not overlapped with any non-dropped measurement gap occasion nor non-dropped MUSIM gap occasion within the window W, after accounting for measurement gap and MUSIM gap collisions as defined in clause 9.1.8 and 9.1.10, and

- Navailable is the number of SSB resource occasions that are not overlapped with any non-dropped measurement gap occasion, non-dropped MUSIM gap occasion nor any SMTC occasion within the window W, after accounting for measurement gap and MUSIM gap collisions as defined in clause 9.1.8 and 9.1.10.

- TL1 is periodicity of the target SSB.

Otherwise, for a UE not supporting *concurrentMeasGap-r17* or when concurrent gaps are not configured, and UE does not support *musim-GapPreference-r17* or when no MUSIM gaps are configured,

*Editor Note: FFS whether and how to update definition of GAP to include MUSIM gap.*

*Editor Note: FFS for the case when Navailable = 0 due to fully overlapping between SSB occasions and the union of MUSIM gap and measurement gap occasions within the window W.*

For FR1,

- P=$\frac{1}{1-\frac{T\_{SSB}}{xGP}}$, when in the monitored cell there are GAPs configured for intra-frequency, inter-frequency or inter-RAT measurements, which are overlapping with some but not all occasions of the SSB; and

- P=1 when in the monitored cell there are no GAPs overlapping with any occasion of the SSB.

For FR2,

 P1=$ \frac{1}{1-\frac{T\_{SSB}}{T\_{SMTCperiod}}}$, when SSB is not overlapped with measurement gap and SSB is partially overlapped with SMTC occasion (TSSB < TSMTCperiod).

- P is PL1\_sharing\*Psharing factor, when SSB is not overlapped with measurement gap and SSB is fully overlapped with SMTC period (TSSB = TSMTCperiod).

- P1=$\frac{1}{1-\frac{T\_{SSB}}{xRP}-\frac{T\_{SSB}}{T\_{SMTCperiod}}}$, when SSB is partially overlapped with GAP and SSB is partially overlapped with SMTC occasion (TSSB < TSMTCperiod) and SMTC occasion is not overlapped with GAP and

- TSMTCperiod ≠ xRP or

- TSMTCperiod = xRP and TSSB < 0.5\*TSMTCperiod

- P is $\frac{P\_{sharing factor}}{1-\frac{T\_{SSB}}{xRP}}$, when SSB is partially overlapped with GAP and SSB is partially overlapped with SMTC occasion (TSSB < TSMTCperiod) and SMTC occasion is not overlapped with GAP and TSMTCperiod = xRP and TSSB = 0.5\*TSMTCperiod

- P1=$ \frac{1}{1-\frac{T\_{SSB}}{min(T\_{SMTCperiod},xRP)}}$, when SSB is partially overlapped with GAP (TSSB < xRP) and SSB is partially overlapped with SMTC occasion (TSSB < TSMTCperiod) and SMTC occasion is partially or fully overlapped with GAP.

- P is $ P\_{L1\\_sharing}\*\frac{P\_{sharing factor}}{1-\frac{T\_{SSB}}{xRP}}$, when SSB is partially overlapped with measurement gap and SSB is fully overlapped with SMTC occasion (TSSB = TSMTCperiod) and SMTC occasion is partially overlapped with GAP (TSMTCperiod < xRP)

-

- If SSB resource from the cell with different PCI is configured for L1-RSRP measurement, and P2 is valid accoding to 9.13.4.1, and any symbol of the SSBs from serving cell and cell with different PCI are overlapping or adjacent (in time domain)

- P = $\frac{P\_{1}}{1-\frac{P\_{1}\*T\_{SSB}}{P\_{2}\*T\_{SSB\\_CDP}}}$ , if P1\*TSSB < P2\*TSSB\_CDP.

- P = P1, if P1\*TSSB > P2\*TSSB\_CDP.

- P = 2\*P1, if P1\*TSSB = P2\*TSSB\_CDP.

- Otherwise, P = P1

Where:

- TSSB = ssb-periodicityServingCell of the serving cell

- TSMTCperiod = the configured SMTC period

- TSSB\_CDP = SSB periodicity of the cell with PCI different from serving cell

- Psharing factor = 1, if the SSB configured for L1-RSRP measurement outside gap is

- not overlapped with the SSB symbols indicated by *SSB-ToMeasure* and 1 data symbol before each consecutive SSB symbols indicated by *SSB-ToMeasure* and 1 data symbol after each consecutive SSB symbols indicated by *SSB-ToMeasure*, given that *SSB-ToMeasure* is configured, where the *SSB-ToMeasure* is the union set of *SSB-ToMeasure* from all the configured measurement objects merged on the same serving carrier, and,

- not overlapped by the RSSI symbols indicated by *ss-RSSI-Measurement* and 1 data symbol before each RSSI symbol indicated by *ss-RSSI-Measurement* and 1 data symbol after each RSSI symbol indicated by *ss-RSSI-Measurement*, given that *ss-RSSI-Measurement* is configured.

- Psharing factor = 3, otherwise.

- PL1\_sharing = 2, if SSB resource from the cell with different PCI is configured for L1-RSRP measurement, and Psharing\_factor,CDP is used in 9.13.4.1, and any symbol of the SSBs from serving cell and cell with different PCI are overlapping or adjacent (in time domain). PL1\_sharing = 1, otherwise.

- TSSB = ssb-periodicityServingCell

- TSMTCperiod = the configured SMTC period

- If the UE is configured with Pre-MG, an SSB or an SMTC occasion is only considered to be overlapped by the Pre-MG if the Pre-MG is activated.

- When a measurement gap is configured and the measurement gap is not NCSG,

- an SSB or an SMTC occasion is considered to be overlapped with the GAP if it overlaps a measurement gap occasion, and

- xRP = MGRP

- Otherwise, when NCSG measurement gap is configured,

- an SSB or an SMTC occasion is considered to be overlapped with the GAP if

- it overlaps the VIL1 or VIL2 of NCSG, or

- it overlaps the ML of NCSG in FR2, and there exists a target carrier to be measured within NCSG that is intra-frequency carrier or inter-frequency carrier in the same band as the serving cell, or inter-frequency carrier in different band as the serving cell and UE does not support IBM between the target carrier and the serving cell,

- and

- xRP = VIRP

- When concurrent gaps are configured, an SSB or an SMTC occasion is not considered to be overlapped by a gap occasion if the gap occasion is dropped according to 9.1.8.

If the high layer in TS 38.331 [2] signaling of *smtc2* is configured, TSMTCperiod corresponds to the value of higher layer parameter *smtc2*; Otherwise TSMTCperiod corresponds to the value of higher layer parameter *smtc1*. TSMTCperiod is the shortest SMTC period among all CCs in the same FR2 band, provided the SMTC offset of all CCs in FR2 have the same offset.

Longer evaluation period would be expected if the combination of SSB, SMTC occasion and GAP configurations does not meet pervious conditions.

When UE is configured with aperiodic MUSIM gap via *MUSIM-GapConfig-r17* and the aperiodic MUSIM gap is overlapping with SSB resource occasion for L1-RSRP, longer evaluation period would be expected.

When UE is configured with periodic MUSIM gap(s), and if SSB resource occasions for L1-RSRP are fully overlapped with MUSIM gap(s), no requirement applies for the SSB based L1-RSRP measurement.

For either an FR1 or FR2 serving cell, longer evaluation period would be expected during the period Tidentify\_CGI when the UE is requested to decode an NR CGI.

For either an FR1 or FR2 serving cell, longer L1 RSRP measurement period would be expected during the period Tidentify\_CGI,E-UTRAN when the UE is requested to decode an LTE CGI.

Table 9.5.4.1-1: Measurement period TL1-RSRP\_Measurement\_Period\_SSB for FR1

|  |  |
| --- | --- |
| Configuration | TL1-RSRP\_Measurement\_Period\_SSB (ms)  |
| non-DRX | max(TReport, ceil(M\*P)\*TSSB) |
| DRX cycle ≤ 320ms | max(TReport, ceil(K \*M\*P)\*max(TDRX,TSSB)) |
| DRX cycle > 320ms | ceil(M\*P)\*TDRX |
| Note 1: TSSB = ssb-periodicityServingCell is the periodicity of the SSB-Index configured for L1-RSRP measurement. TDRX is the DRX cycle length. TReport is configured periodicity for reporting.Note 2: K = 1 when TSSB ≤ 40 ms and *highSpeedMeasFlag-r16 or highSpeedMeasCA-Scell-r17* are configured; otherwise K = 1.5.Note 3: When *highSpeedMeasFlag-r16* is configured, the requirements apply only to UE supporting either *measurementEnhancement-r16* or *intraNR-MeasurementEnhancement-r16. or measurementEnhancementCA-r17* |

Table 9.5.4.1-2: Measurement period TL1-RSRP\_Measurement\_Period\_SSB for FR2

|  |  |
| --- | --- |
| Configuration | TL1-RSRP\_Measurement\_Period\_SSB (ms)  |
| non-DRX | max(TReport, ceil(M\*P\*N)\*TSSB) |
| DRX cycle ≤ 320ms | max(TReport, ceil(1.5\*M\*P\*N)\*max(TDRX,TSSB)) |
| DRX cycle > 320ms | ceil(1.5\*M\*P\*N)\*TDRX |
| Note: TSSB = ssb-periodicityServingCell is the periodicity of the SSB-Index configured for L1-RSRP measurement. TDRX is the DRX cycle length. TReport is configured periodicity for reporting. |

Table 9.5.4.1-3: Measurement period TL1-RSRP\_Measurement\_Period\_SSB configured with *highSpeedMeasFlagFR2-r17* for FR2

|  |  |
| --- | --- |
| Configuration | TL1-RSRP\_Measurement\_Period\_SSB (ms)  |
| non-DRX | max(TReport, ceil(M\*P\*N1Note2)\*TSSB) |
| DRX cycle ≤ 80ms | max(TReport, ceil(M\*P\*N1Note2\*M2)\*max(TDRX,TSSB))  |
| 80ms< DRX ≤ 320ms | max(TReport, ceil(1.5\*M\*P\*N)\*max(TDRX,TSSB)) |
| DRX cycle > 320ms | ceil(1.5\*M\*P\*N)\*TDRX |
| Note1: TSSB = ssb-periodicityServingCell is the periodicity of the SSB-Index configured for L1-RSRP measurement. TDRX is the DRX cycle length. TReport is configured periodicity for reporting.Note 2: N1 = 2 when *highSpeedMeasFlagFR2-r17* = set1; N1 = 6 when *highSpeedMeasFlagFR2-r17* = [set2].Note 3: M2 = 1.5 if SMTC periodicity > 40 ms; otherwise M2 = 1 |

#### 9.5.4.2 CSI-RS based L1-RSRP Reporting

The UE shall be capable of performing L1-RSRP measurements based on the configured CSI-RS resource for L1-RSRP computation, and the UE physical layer shall be capable of reporting L1-RSRP measured over the measurement period of TL1-RSRP\_Measurement\_Period\_CSI-RS.

The value of TL1-RSRP\_Measurement\_Period\_CSI-RS is defined in Table 9.5.4.2-1 for FR1 and in Table 9.5.4.2-2 for FR2, where

- For periodic and semi-persistent CSI-RS resources, M=1 if higher layer parameter *timeRestrictionForChannelMeasurement* is configured, and M=3 otherwise

- For aperiodic CSI-RS resources M=1

- For periodic CSI-RS resources in a resource set configured with higher layer parameter *repetition* set to OFF, N=1. The requirements apply if *qcl-InfoPeriodicCSI-RS* is configured for all the resources in the resource set and for each resource one RS has QCL-TypeD with

- SSB for L1-RSRP measurement, or

- another CSI-RS in resource set configured with repetition ON.

- For periodic CSI-RS resources in a resource set configured with higher layer parameter *repetition* set to ON, N=ceil(*maxNumberRxBeam* / Nres\_per\_set), where Nres\_per\_set is number of resources in the resource set. The requirements apply provided *qcl-InfoPeriodicCSI-RS* is configured with QCL-TypeD for all resources in the resource set.

- For semi-persistent CSI-RS resources in a resource set configured with higher layer parameter *repetition* set to OFF, N=1. The requirements apply provided TCI state is provided for all resources in the resource set in the MAC CE activating the resource set and for each resource one RS has QCL-TypeD with

- SSB for L1-RSRP measurement, or

- another CSI-RS in resource set configured with repetition ON.

- For semi-persistent CSI-RS resources in a resource set configured with higher layer parameter *repetition* set to ON, N=ceil(*maxNumberRxBeam* / Nres\_per\_set), where Nres\_per\_set is number of resources in the resource set. The requirements apply provided TCI state is provided with QCL-TypeD for all resources in the resource set in the MAC CE activating the resource set.

- For aperiodic CSI-RS resources in a resource set configured with higher layer parameter *repetition* set to OFF, N=1. The requirements apply provided *qcl-info* is configured for all resources in the resource set and for each resource one RS has QCL-TypeD with

- SSB for L1-RSRP measurement, or

- another CSI-RS in resource set configured with repetition ON.

- For aperiodic CSI-RS resources in a resource set configured with higher layer parameter *repetition* set to ON, N=1. UE is not required to meet the accuracy requirements in clause 10.1.19.2 and 10.1.20.2 if number of resources in the resource set is smaller than *maxNumberRxBeam*. The requirements apply provided *qcl-info* is configured with QCL-TypeD for all resources in the resource set.

When UE supports [concurrent measurement gap] or *musim-GapPreference-r17* or both concurrent measurement gap and *musim-GapPreference-r17*, and concurrent gaps or periodic MUSIM gaps or both concurrent gaps and periodic MUSIM gaps are configured,

- P value for a CSI-RS resource to be measured is defined as

- Ntotal / Noutside\_MG in FR1

- Psharing factor \* Ntotal / Noutside\_MG in FR2 with Navailable = 0

- Ntotal / Navailable in FR2 with Navailable > 0

- For a window W of duration max(TL1, MGRP\_max), where MGRP max is the maximum MGRP across all configured per-UE measurement gaps, MUSIM gap(s) and per-FR measurement gaps within the same FR as serving cell, and starting at the beginning of any CSI-RS resource occasion:

- Ntotal is the total number of CSI-RS resource occasions within the window, including those overlapped with measurement gap occasions, MUSIM gap occasions or SMTC occasions within the window, and

- Noutside\_MG is the number of CSI-RS resource occasions that are not overlapped with any non-dropped measurement gap occasion nor non-dropped MUSIM gap occasion within the window W, after accounting for measurement gap and MUSIM gap collisions as defined in clause 9.1.8 and 9.1.10, and

- Navailable is the number of CSI-RS resource occasions that are not overlapped with any non-dropped measurement gap occasion, non-dropped MUSIM gap occasion nor any SMTC occasion within the window W, after accounting for measurement gap and MUSIM gap collisions as defined in clause 9.1.8 and 9.1.10.

TL1 is periodicity of the target CSI-RS.

Otherwise, for a UE not supporting *concurrentMeasGap-r17* or when concurrent gaps are not configured, and UE does not support *musim-GapPreference-r17* or when no MUSIM gaps are configured,

*Editor Note: FFS whether and how to update definition of GAP to include MUSIM gap.*

*Editor Note: FFS for the case when Navailable = 0 due to fully overlapping between CSI-RS occasions and the union of MUSIM gap and measurement gap occasions within the window W.*

For FR1,

- P=$\frac{1}{1-\frac{T\_{CSI-RS}}{xRP}}$, when in the monitored cell there are GAPs configured for intra-frequency, inter-frequency or inter-RAT measurements, which are overlapping with some but not all occasions of the CSI-RS; and

- P=1 when in the monitored cell there are no GAPs overlapping with any occasion of the CSI-RS.

For FR2,

- P=1, when CSI-RS is not overlapped with a GAP and also not overlapped with SMTC occasion.

- P=$\frac{1}{1-\frac{T\_{CSI-RS}}{xRP}}$, when CSI-RS is partially overlapped with GAP and CSI-RS is not overlapped with SMTC occasion (TCSI-RS < xRP)

- P=$\frac{1}{1-\frac{T\_{CSI-RS}}{T\_{SMTCperiod}}}$, when CSI-RS is not overlapped with GAP and CSI-RS is partially overlapped with SMTC occasion (TCSI-RS < TSMTCperiod).

- P=Psharing factor, when CSI-RS is not overlapped with GAP and CSI-RS is fully overlapped with SMTC occasion (TCSI-RS = TSMTCperiod).

- P=1, when aperiodic CSI-RS resource is not overlapped with GAP

- P=$ \frac{1}{1-\frac{T\_{CSI-RS}}{xRP}-\frac{T\_{CSI-RS}}{T\_{SMTCperiod}}}$, when CSI-RS is partially overlapped with GAP and CSI-RS is partially overlapped with SMTC occasion (TCSI-RS < TSMTCperiod) and SMTC occasion is not overlapped with GAP and

- TSMTCperiod ≠ xRP or

- TSMTCperiod = xRP and TCSI-RS < 0.5\*TSMTCperiod

- P=$\frac{3}{1-\frac{T\_{CSI-RS}}{xRP}}$, when CSI-RS is partially overlapped with [measurement gap] and CSI-RS is partially overlapped with SMTC occasion (TCSI-RS < TSMTCperiod) and SMTC occasion is not overlapped with GAP and TSMTCperiod = xRP and TCSI-RS = 0.5\*TSMTCperiod

- P=$ \frac{1}{1-\frac{T\_{CSI-RS}}{T\_{SMTCperiod}}}$, when CSI-RS is partially overlapped with GAP (TCSI-RS < xRP) and CSI-RS is partially overlapped with SMTC occasion (TCSI-RS < TSMTCperiod) and SMTC occasion is partially or fully overlapped with GAP.

- P=$\frac{P\_{sharing factor}}{1-\frac{T\_{CSI-RS}}{xRP}}$, when CSI-RS is partially overlapped with GAP and CSI-RS is fully overlapped with SMTC occasion (TCSI-RS = TSMTCperiod) and SMTC occasion is partially overlapped with GAP (TSMTCperiod < xRP)

Where:

- Psharing factor = 1, if the CSI-RS configured for L1-RSRP measurement outside gap is

- not overlapped with the SSB symbols indicated by *SSB-ToMeasure* and 1 data symbol before each consecutive SSB symbols indicated by *SSB-ToMeasure* and 1 data symbol after each consecutive SSB symbols indicated by *SSB-ToMeasure*, given that *SSB-ToMeasure* is configured, where the *SSB-ToMeasure* is the union set of *SSB-ToMeasure* from all the configured measurement objects merged on the same serving carrier, and,

- not overlapped by the RSSI symbols indicated by *ss-RSSI-Measurement* and 1 data symbol before each RSSI symbol indicated by *ss-RSSI-Measurement* and 1 data symbol after each RSSI symbol indicated by *ss-RSSI-Measurement*, given that *ss-RSSI-Measurement* is configured.

- Psharing factor = 3, otherwise.

TSMTCperiod = the configured SMTC period.

 TCSI-RS = the periodicity of CSI-RS configured for L1-RSRP measurement

 If the UE is configured with Pre-MG, a CSI-RS or an SMTC occasion is only considered to be overlapped by the Pre-MG if the Pre-MG is activated.

- When a measurement gap is configured and the measurement gap is not NCSG,

- a CSI-RS or an SMTC occasion is considered to be as overlapped with the GAP if it overlapps a measurement gap occasion, and

- xRP = MGRP

- Otherwise, when NCSG measurement gap is configured,

- a CSI-RS or an SMTC occasion is considered to be as overlapped with the GAP if

- it overlaps the VIL1 or VIL2 of NCSG, or

- it overlaps the ML of NCSG in FR2, and there exists a target carrier to be measured within NCSG that is intra-frequency carrier or inter-frequency carrier in the same band as the serving cell, or inter-frequency carrier in different band as the serving cell and UE does not support IBM between the target carrier and the serving cell,

- and

- xRP = VIRP

When UE is configured with aperiodic MUSIM gap via *MUSIM-GapConfig-r17* and the aperiodic MUSIM gap is overlapping with CSI-RS resource occasion for L1-RSRP, longer evaluation period would be expected.

When UE is configured with periodic MUSIM gap(s), and if CSI-RS resource occasions for L1-RSRP are fully overlapped with MUSIM gap(s), no requirement applies for the CSI-RS based L1-RSRP measurement.

When concurrent gaps are configured, a CSI-RS or an SMTC occasion is not considered to be overlapped by a gap occasion if the gap occasion is dropped according to 9.1.8.

Table 9.5.4.2-1: Measurement period TL1-RSRP\_Measurement\_Period\_CSI-RS for FR1

|  |  |
| --- | --- |
| Configuration | TL1-RSRP\_Measurement\_Period\_CSI-RS (ms)  |
| non-DRX | max(TReport, ceil(M\*P)\*TCSI-RS) |
| DRX cycle ≤ 320ms | max(TReport, ceil(K \*M\*P)\*max(TDRX,TCSI-RS)) |
| DRX cycle > 320ms | ceil(M\*P)\*TDRX |
| Note 1: TCSI-RS is the periodicity of CSI-RS configured for L1-RSRP measurement. TDRX is the DRX cycle length. TReport is configured periodicity for reporting.Note 2: the requirements are applicable provided that the CSI-RS resource configured for L1-RSRP measurement is transmitted with Density = 3.Note 3: K = 1 when TCSI-RS ≤ 40 ms and *highSpeedMeasFlag-r16 or highSpeedMeasCA-Scell-r17* are configured; otherwise K = 1.5.Note 4: When *highSpeedMeasFlag-r16* is configured, the requirements apply only to UE supporting either *measurementEnhancement-r16* or *intraNR-MeasurementEnhancement-r16 or measurementEnhancementCA-r17.* |

Table 9.5.4.2-2: Measurement period TL1-RSRP\_Measurement\_Period\_CSI-RS for FR2

|  |  |
| --- | --- |
| Configuration | TL1-RSRP\_Measurement\_Period\_CSI-RS (ms)  |
| non-DRX | max(TReport, ceil(M\*P\*N)\*TCSI-RS) |
| DRX cycle ≤ 320ms | max(TReport, ceil(1.5\*M\*P\*N)\*max(TDRX,TCSI-RS)) |
| DRX cycle > 320ms | ceil(M\*P\*N)\*TDRX |
| Note 1: TCSI-RS is the periodicity of CSI-RS configured for L1-RSRP measurement. TDRX is the DRX cycle length. TReport is configured periodicity for reporting.Note 2: the requirements are applicable provided that the CSI-RS resource configured for L1-RSRP measurement is transmitted with Density = 3. |

**----------------------END OF CHANGES 5----------------------------**

**----------------------START OF CHANGE 6 ----------------------------**

#### 9.8.4.1 L1-SINR reporting with CSI-RS based CMR and no dedicated IMR configured

edicated resource configured as IMR for L1-SINR computation, and the UE physical layer shall be capable of reporting L1-SINR measured over the measurement period of TL1-SINR\_Measurement\_Period\_CSI-RS\_CMR\_Only.

The value of TL1-SINR\_Measurement\_Period\_CSI-RS\_CMR\_Only is defined in Table 9.8.4.1-1 for FR1 and in Table 9.8.4.1-2 for FR2, where

For the value of M,

- For periodic and semi-persistent CSI-RS resources as CMR, M=1 if higher layer parameter *timeRestrictionForChannelMeasurement* is configured, and M=3 otherwise;

- For aperiodic CSI-RS resources as CMR, M=1.

For the value of N in FR2

- For periodic CSI-RS resources as CMR in a resource set configured with higher layer parameter *repetition* set to OFF, N=1. The requirements apply if *qcl-InfoPeriodicCSI-RS* is configured for all the resources in the resource set and for each resource one RS has QCL-TypeD with

- SSB for L1-RSRP or L1-SINR measurement, or

- another CSI-RS in resource set configured with repetition ON.

- For periodic CSI-RS resources as CMR in a resource set configured with higher layer parameter *repetition* set to ON, N=ceil(*maxNumberRxBeam* / Nres\_per\_set), where Nres\_per\_set is number of resources in the resource set. The requirements apply provided *qcl-InfoPeriodicCSI-RS* is configured for all resources in the resource set.

- For semi-persistent CSI-RS resources as CMR in a resource set configured with higher layer parameter *repetition* set to OFF, N=1. The requirements apply provided TCI state is provided for all resources in the resource set in the MAC CE activating the resource set and for each resource has QCL-TypeD with

- SSB for L1-RSRP or L1-SINR measurement, or

- another CSI-RS in resource set configured with repetition ON.

- For semi-persistent CSI-RS resources as CMR in a resource set configured with higher layer parameter *repetition* set to ON, N=ceil(*maxNumberRxBeam* / Nres\_per\_set), where Nres\_per\_set is number of resources in the resource set. The requirements apply provided TCI state is provided for all resources in the resource set in the MAC CE activating the resource set.

- For aperiodic CSI-RS resources as CMR in a resource set configured with higher layer parameter *repetition* set to OFF, N=1. The requriements apply provided *qcl-info* is configured for all resources in the resource set and for each resource has QCL-TypeD with

- SSB for L1-RSRP or L1-SINR measurement, or

- another CSI-RS in resource set configured with repetition ON.

- For aperiodic CSI-RS resources as CMR in a resource set configured with higher layer parameter *repetition* set to ON, N=1. UE is not required to meet the accuracy requirements in clause 10.1.28.1 and 10.1.28.3 if number of resources in the resource set is smaller than *maxNumberRxBeam*. The requriements apply provided *qcl-info* is configured for all resources in the resource set.

When UE supports concurrent measurement gap or *musim-GapPreference-r17* or both concurrent measurement gap and *musim-GapPreference-r17*, and concurrent gaps or periodic MUSIM gaps or both concurrent gaps and periodic MUSIM gaps are configured,

- P value for a CSI-RS resource to be measured is defined as

- Ntotal / Noutside\_MG in FR1

- Psharing factor \* Ntotal / Noutside\_MG in FR2 with Navailable = 0

- Ntotal / Navailable in FR2 with Navailable > 0

- For a window W of duration max(TL1, MGRP\_max), where MGRP max is the maximum MGRP across all configured per-UE measurement gaps, periodic MUSIM gap(s) and per-FR measurement gaps within the same FR as serving cell, and starting at the beginning of any CSI-RS resource occasion:

- Ntotal is the total number of CSI-RS resource occasions within the window, including those overlapped with measurement gap occasions, MUSIM gap occasions or SMTC occasions within the window, and

- Noutside\_MG is the number of CSI-RS resource occasions that are not overlapped with any non-dropped measurement gap occasion nor non-dropped MUSIM gap occasion within the window W, after accounting for measurement gap and MUSIM gap collisions as defined in clause 9.1.8, and 9.1.10, and

- Navailable is the number of CSI-RS resource occasions that are not overlapped with any non-dropped measurement gap occasion, non-dropped MUSIM gap occasion nor any SMTC occasion within the window W, after accounting for measurement gap and MUSIM gap collisions as defined in clause 9.1.8, and 9.1.10

- TL1 is periodicity of the target CSI-RS.

Otherwise, for a UE not supporting *concurrentMeasGap-r17* or when concurrent gaps are not configured, and UE does not support *musim-GapPreference-r17* or when no MUSIM gaps are configured,

*Editor Note: FFS whether and how to update definition of GAP to include MUSIM gap.*

*Editor Note: FFS for the case when Navailable = 0 due to fully overlapping between CSI-RS occasions and the union of MUSIM gap and measurement gap occasions within the window W.*

For the value of P in FR1,

- P=$\frac{1}{1-\frac{T\_{CSI-RS}}{xGP}}$, when in the monitored cell there are [measurement gaps] configured for intra-frequency, inter-frequency or inter-RAT measurements, which are overlapping with some but not all occasions of the CSI-RS; and

- P=1 when in the monitored cell there are no GAPs overlapping with any occasion of the CSI-RS.

For the value of P in FR2,

- P=1, when CSI-RS is not overlapped with GAP and also not overlapped with SMTC occasion.

- P=$\frac{1}{1-\frac{T\_{CSI-RS}}{xGP}}$, when CSI-RS is partially overlapped with GAP and CSI-RS is not overlapped with SMTC occasion (TCSI-RS < xRP)

- P=$\frac{1}{1-\frac{T\_{CSI-RS}}{T\_{SMTCperiod}}}$, when CSI-RS is not overlapped with GAP and CSI-RS is partially overlapped with SMTC occasion (TCSI-RS < TSMTCperiod).

- P is Psharing factor,, when CSI-RS is not overlapped with [measurement gap] and CSI-RS is fully overlapped with SMTC occasion (TCSI-RS = TSMTCperiod).

- P=$ \frac{1}{1-\frac{T\_{CSI-RS}}{xGP}-\frac{T\_{CSI-RS}}{T\_{SMTCperiod}}}$, when CSI-RS is partially overlapped with [measurement gap] and CSI-RS is partially overlapped with SMTC occasion (TCSI-RS < TSMTCperiod) and SMTC occasion is not overlapped with GAP and

- TSMTCperiod ≠ xRP or

- TSMTCperiod = xRP and TCSI-RS < 0.5\*TSMTCperiod

- P=$\frac{P\_{sharing factor}}{1-\frac{T\_{CSI-RS}}{xGP}}$, when CSI-RS is partially overlapped with [measurement gap] and CSI-RS is partially overlapped with SMTC occasion (TCSI-RS < TSMTCperiod) and SMTC occasion is not overlapped with GAP and TSMTCperiod = xRP and TCSI-RS = 0.5\*TSMTCperiod

- P=$ \frac{1}{1-\frac{T\_{CSI-RS}}{min⁡(T\_{SMTCperiod},xRP)}}$, when CSI-RS is partially overlapped with [measurement gap] (TCSI-RS < xRP) and CSI-RS is partially overlapped with SMTC occasion (TCSI-RS < TSMTCperiod) and SMTC occasion is partially or fully overlapped with GAP .

- P=$\frac{P\_{sharing factor}}{1-\frac{T\_{CSI-RS}}{xGP}}$, when CSI-RS is partially overlapped with [measurement gap] and CSI-RS is fully overlapped with SMTC occasion (TCSI-RS = TSMTCperiod) and SMTC occasion is partially overlapped with GAP (TSMTCperiod < xRP)

Where:

 Psharing factor = 1, if the CSI-RS configured for L1-SINR measurement outside gap is

 not overlapped with the SSB symbols indicated by *SSB-ToMeasure* and 1 data symbol before each consecutive SSB symbols indicated by *SSB-ToMeasure* and 1 data symbol after each consecutive SSB symbols indicated by *SSB-ToMeasure*, given that *SSB-ToMeasure* is configured, where the *SSB-ToMeasure* is the union set of *SSB-ToMeasure* from all the configured measurement objects merged on the same serving carrier, and,

 not overlapped by the RSSI symbols indicated by *ss-RSSI-Measurement* and 1 data symbol before each RSSI symbol indicated by *ss-RSSI-Measurement* and 1 data symbol after each RSSI symbol indicated by *ss-RSSI-Measurement*, given that *ss-RSSI-Measurement* is configured.

- Psharing factor = 3, otherwise.

- TSMTCperiod = the configured SMTC1 period or SMTC2 period if configured.

- TCSI-RS = the periodicity of CSI-RS configured for L1-SINR measurement

- If the UE is configured with Pre-MG, a CSI-RS reourse or an SMTC occasion is only considered to be overlapped by the Pre-MG if the Pre-MG is activated.

- When a measurement gap is configured and the measurement gap is not NCSG,

- a CSI-RS is considered to be overlapped with the GAP if it overlaps a measurement gap occasion, and

- xRP = MGRP

- Otherwise, when NCSG measurement gap is configured,

- a CSI-RS is considered to be overlapped with the GAP if

- it overlaps the VIL1 or VIL2 of NCSG, or

- it overlaps the ML of NCSG in FR2, and there exists a target carrier to be measured within NCSG that is intra-frequency carrier or inter-frequency carrier in the same band as the serving cell, or inter-frequency carrier in different band as the serving cell and UE does not support IBM between the target carrier and the serving cell,

- and

- xRP = VIRP

- When concurrent gaps are configured, a CSI-RS or an SMTC occasion is not considered to be overlapped by a gap occasion if the gap occasion is dropped according to 9.1.8.

If the high layer in TS 38.331 [2] signaling of *smtc2* is configured, TSMTCperiod corresponds to the value of higher layer parameter *smtc2*; Otherwise TSMTCperiod corresponds to the value of higher layer parameter *smtc1*.

Note: The overlap between CSI-RS for L1-SINR measurement and SMTC means that CSI-RS for L1-SINR measurement is within the SMTC window duration.

When UE is configured with aperiodic MUSIM gap via *MUSIM-GapConfig-r17* and the aperiodic MUSIM gap is overlapping with CSI-RS resource occasion for L1-SINR, longer evaluation period would be expected.

When UE is configured with periodic MUSIM gap(s), and if CSI-RS resource occasions for L1-SINR are fully overlapped with MUSIM gap(s), no requirement applies for the CSI-RS based L1-SINR measurement.

Longer evaluation period would be expected if the combination of CSI-RS, SMTC occasion and GAP configurations does not meet pervious conditions.

Table 9.8.4.1-1: Measurement period TL1-SINR\_Measurement\_Period\_CSI-RS\_CMR\_Only for FR1

|  |  |
| --- | --- |
| Configuration | TL1-SINR\_Measurement\_Period\_CSI-RS\_CMR\_Only (ms)  |
| non-DRX | max(TReport, ceil(M\*P)\*TCSI-RS) |
| DRX cycle ≤ 320ms | max(TReport, ceil(1.5\*M\*P)\*max(TDRX,TCSI-RS)) |
| DRX cycle > 320ms | ceil(M\*P)\*TDRX |
| Note 1: TCSI-RS is the periodicity of CSI-RS configured for L1-SINR measurement. TDRX is the DRX cycle length. TReport is configured periodicity for reporting.Note 2: the requirements are applicable provided that the CSI-RS resource configured for L1-SINR measurement is transmitted with Density = 3. |

Table 9.8.4.1-2: Measurement period TL1-SINR\_Measurement\_Period\_CSI-RS\_CMR\_Only for FR2

|  |  |
| --- | --- |
| Configuration | TL1-SINR\_Measurement\_Period\_CSI-RS\_CMR\_Only (ms)  |
| non-DRX | max(TReport, ceil(M\*P\*N)\*TCSI-RS) |
| DRX cycle ≤ 320ms | max(TReport, ceil(1.5\*M\*P\*N)\*max(TDRX,TCSI-RS)) |
| DRX cycle > 320ms | ceil(M\*P\*N)\*TDRX |
| Note 1: TCSI-RS is the periodicity of CSI-RS configured for L1-SINR measurement. TDRX is the DRX cycle length. TReport is configured periodicity for reporting.Note 2: the requirements are applicable provided that the CSI-RS resource configured for L1-SINR measurement is transmitted with Density = 3. |

**----------------------END OF CHANGES 6----------------------------**

**----------------------START OF CHANGE 7 ----------------------------**

#### 9.13.4.1 Inter-cell SSB based L1-RSRP Reporting

If a cell with PCI different from serving cell is known according 9.13.2, the UE shall be capable of performing L1-RSRP measurements based on the configured SSB resource for L1-RSRP computation, and the UE physical layer shall be capable of reporting L1-RSRP measured over the measurement period of TL1-RSRP\_Measurement\_Period\_SSB\_CDP. The requirements specified in this clause are only applicable when

- *highSpeedMeasFlag-r16* is not configured, and

- *highSpeedMeasFlagFR2-r17* is not configured, and

- highSpeedMeasCA-Scell-r17 is not configured, and

- SSBs of CDP outside SMTCs for L1-RSRP measurement are not overlapped with concurrent gaps.

The value of TL1-RSRP\_Measurement\_Period\_SSB\_CDP is defined in Table 9.13.4.1-1 for FR1, The value of TL1-RSRP\_Measurement\_Period\_SSB\_CDP is defined in Table 9.13.4.1-2 for FR2 when *highSpeedMeasFlagFR2-r17* is not configured, where

- M=1 if higher layer parameter *timeRestrictionForChannelMeasurement* is configured, and M=3 otherwise

- N= 8.

When UE supports *musim-GapPreference-r17*, and periodic MUSIM gaps are configured,

- P value for SSB resource to be measured is defined as

- Ntotal / Noutside\_MG in FR1

- P = PL1\_sharing factor \* Psharing factor \* Ntotal / Noutside\_MG in FR2, if Navailable = 0

- P is defined as below based on P2, where P2 = Ntotal / Navailable in FR2, if Navailable > 0

- For a window W of duration max(TL1, MGRP\_max), where MGRP max is the maximum MGRP across all configured per-UE measurement gaps, MUSIM gap(s) and/or per-FR measurement gaps within the same FR as serving cell, and starting at the beginning of any SSB resource occasion:

- Ntotal is the total number of SSB resource occasions within the window, including those overlapped with measurement gap occasions, MUSIM gap occasions or SMTC occasions within the window, and

- Noutside\_MG is the number of SSB resource occasions that are not overlapped with any non-dropped measurement gap occasion nor non-dropped MUSIM gap occasion within the window W, after accounting for measurement gap and MUSIM gap collisions as defined in clause 9.1.8, and

- Navailable is the number of SSB resource occasions that are not overlapped with any non-dropped measurement gap occasion, non-dropped MUSIM gap occasion nor any SMTC occasion within the window W, after accounting for measurement gap and MUSIM gap collisions as defined in clause 9.1.8.

- TL1 is periodicity of the target SSB.

Otherwise, when UE does not support *musim-GapPreference-r17* or when no MUSIM gaps are configured,

*Editor Note: FFS for the case when Navailable = 0 due to fully overlapping between SSB occasions and the union of MUSIM gap and measurement gap occasions within the window W.*

For FR1,

- P=$\frac{1}{1-\frac{T\_{SSB\\_CDP}}{MRGP}}$, when in the monitored cell there are measurement gaps configured for intra-frequency, inter-frequency or inter-RAT measurements, which are overlapping with some but not all occasions of the SSB; and

- P=1 when in the monitored cell there are no measurement gaps overlapping with any occasion of the SSB.

For FR2,

- P is PL1\_sharing\*Psharing factor, CDP, when SSB is not overlapped with measurement gap and SSB is fully overlapped with SMTC period (TSSB\_CDP = TSMTCperiod), and TSSB\_SC = TSMTCperiod.

- P is $ P\_{L1\\_sharing}\*\frac{P\_{sharing factor}}{1-\frac{T\_{SSB}}{xRP}}$, when SSB is partially overlapped with measurement gap and SSB is fully overlapped with SMTC occasion (TSSB = TSMTCperiod) and SMTC occasion is partially overlapped with GAP (TSMTCperiod < xRP), and TSSB\_SC = TSMTCperiod.

- P2=$\frac{1}{1-\frac{T\_{SSB\\_CDP}}{T\_{SMTCperiod}}}$, when SSB is not overlapped with measurement gap and SSB is partially overlapped with SMTC occasion (TSSB\_CDP < TSMTCperiod).

- P2=$ \frac{1}{1-\frac{T\_{SSB\\_CDP}}{MGRP}-\frac{T\_{SSB\\_CDP}}{T\_{SMTCperiod}}}$, when SSB is partially overlapped with measurement gap and SSB is partially overlapped with SMTC occasion (TSSB\_CDP < TSMTCperiod) and SMTC occasion is not overlapped with measurement gap and

- TSMTCperiod ≠ MGRP or

- TSMTCperiod = MGRP and TSSB\_CDP < 0.5\*TSMTCperiod

- P2= $\frac{1}{1-\frac{T\_{SSB\\_CDP}}{min(T\_{SMTCperiod},MGRP)}}$,when SSB is partially overlapped with measurement gap (TSSB\_CDP <MGRP) and SSB is partially overlapped with SMTC occasion (TSSB\_CDP < TSMTCperiod) and SMTC occasion is partially or fully overlapped with measurement gap.

- If SSB resource from serving cell is configured for L1-RSRP measurements, and P1 is valid accoding to 9.5.4.1, and any symbol of the SSBs from serving cell and cell with different PCI are overlapping or adjacent (in time domain)

- P = $\frac{P\_{2}}{1-\frac{P\_{2}\*T\_{SSB\\_CDP}}{P\_{1}\*T\_{SSB\\_SC}}}$ , if P2\*TSSB\_CDP < P1\*TSSB\_SC.

- P = P2, if P2\*TSSB\_CDP> P1\*TSSB\_SC.

- P = 2\*P2, if P1\*TSSB\_SC = P2\*TSSB\_CDP.

 - Otherwise, P = P2

- TSSB\_CDP = SSB periodicity of the cell with PCI different from serving cell

- TSMTCperiod = the configured SMTC period

- TSSB\_SC = ssb-periodicityServingCell of the serving cell

Psharing factor = 1, if the SSB configured for L1-RSRP measurement outside measurement gap is

- not overlapped with the SSB symbols indicated by *SSB-ToMeasure* and 1 data symbol before each consecutive SSB symbols indicated by *SSB-ToMeasure* and 1 data symbol after each consecutive SSB symbols indicated by *SSB-ToMeasure*, given that *SSB-ToMeasure* is configured, where the *SSB-ToMeasure* is the union set of *SSB-ToMeasure* from all the configured measurement objects merged on the same serving carrier, and,

- not overlapped with the RSSI symbols indicated by *ss-RSSI-Measurement* and 1data symbol before each RSSI symbol indicated by *ss-RSSI-Measurement* and 1 data symbol after each RSSI symbol indicated by *ss-RSSI-Measurement*, given that *ss-RSSI-Measurement* is configured,

Psharing factor = 3, otherwise.

PL1\_sharing = 2, if SSB resource from serving cell is configured for L1-RSRP measurements, and Psharing\_factor is used in 9.5.4.1, and any symbol of the SSBs from serving cell and cell with different PCI are overlapping or adjacent (in time domain). PL1\_sharing = 1, otherwise.

If the high layer in TS 38.331 [2] signaling of *smtc2* is configured, TSMTCperiod corresponds to the value of higher layer parameter *smtc2*; Otherwise TSMTCperiod corresponds to the value of higher layer parameter *smtc1*. TSMTCperiod is the shortest SMTC period among all CCs in the same FR2 band, provided the SMTC offset of all CCs in FR2 have the same offset.

Longer evaluation period would be expected if the combination of SSB, SMTC occasion and measurement gap configurations does not meet pervious conditions.

For either an FR1 or FR2 cell with PCI different from serving cell, longer evaluation period would be expected during the period Tidentify\_CGI when the UE is requested to decode an NR CGI.

When UE is configured with aperiodic MUSIM gap via *MUSIM-GapConfig-r17* and the aperiodic MUSIM gap is overlapping with SSB resource occasion for inter-cell L1-RSRP, longer evaluation period would be expected.

When UE is configured with periodic MUSIM gap(s), and if SSB resource occasions for inter-cell L1-RSRP are fully overlapped with MUSIM gap(s), no requirement applies for the SSB based inter-cell L1-RSRP measurement.

For either an FR1 or FR2 cell with PCI different from serving cell, longer L1 RSRP measurement period would be expected during the period Tidentify\_CGI,E-UTRAN when the UE is requested to decode an LTE CGI.

Table 9.13.4.1-1: Inter-cell L1-RSRP measurement period TL1-RSRP\_Measurement\_Period\_SSB\_CDP for known cells with different PCIs in FR1

|  |  |
| --- | --- |
| Configuration | TL1-RSRP\_Measurement\_Period\_SSB\_CDP (ms)  |
| non-DRX | max(TReport, ceil(M\*P)\*TSSB\_CDP) |
| DRX cycle ≤ 320ms | max(TReport, ceil(K \*M\*P)\*max(TDRX,TSSB\_CDP)) |
| DRX cycle > 320ms | ceil(M\*P)\*TDRX |
| Note 1: TSSB\_CDP is the periodicity of the SSB-Index configured for inter-cell L1-RSRP measurement. TDRX is the DRX cycle length. TReport is configured periodicity for reporting.Note 2: K = 1.5.  |

Table 9.13.4.1-2: Inter-cell L1-RSRP measurement period TL1-RSRP\_Measurement\_Period\_SSB\_CDP for known cells with different PCIs in FR2

|  |  |
| --- | --- |
| Configuration | TL1-RSRP\_Measurement\_Period\_SSB\_CDP (ms)  |
| non-DRX | max(TReport, ceil(M\*P\*N)\*TSSB\_CDP) |
| DRX cycle ≤ 320ms | max(TReport, ceil(1.5\*M\*P\*N)\*max(TDRX,TSSB\_CDP)) |
| DRX cycle > 320ms | ceil(1.5\*M\*P\*N)\*TDRX |
| Note: TSSB\_CDP is the periodicity of the SSB-Index configured for inter-cell L1-RSRP measurement. TDRX is the DRX cycle length. TReport is configured periodicity for reporting. |

**----------------------End OF CHANGE 7----------------------------**